

2011 Bioenergy Action Plan

Prepared by the California Energy Commission for the
Bioenergy Interagency Working Group:

*California Air Resources Board
California Energy Commission
California Environmental Protection Agency
California Department of Food and Agriculture
California Department of Forestry and Fire Protection
California Department of General Services
California Natural Resources Agency
California Public Utilities Commission
California Department of Resources Recycling and Recovery
California Water Resources Control Board
California Biomass Collaborative*

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CALIFORNIA ENERGY COMMISSION

RENEWABLES COMMITTEE

James D. Boyd
Vice Chair
Presiding Member

Robert B. Weisenmiller
Chair
Associate Member

Garry O'Neill
Primary Author

John Nuffer
Project Manager

Tony Gonçalves
Office Manager
Renewable Energy Office

Panama Bartholomy
Deputy Director
Efficiency and Renewables Division

Melissa Jones
Executive Director

DISCLAIMER

This report was prepared by the California Energy Commission Renewables Committee as part of the Preparation of the 2011 Bioenergy Action Plan – docket # 10-BAP-01. The report will be considered for adoption by the full Energy Commission at its Business Meeting on March, 23, 2011. The views and recommendations contained in this document are not official policy of the Energy Commission until the report is adopted.

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Air Resources Board:

Judith Friedman
Kitty Howard
Manpreet Badyal

Energy Commission:

Brian McCollough
Brian Stevens
Julia Jarass
Julia Moshkin
Mark Kootstra
Otto Tang
Rachel Salazar
Rhetta DeMesa
Pam Doughman
Sandra Fromm
Sarah Michael
Susan Brown
Zhiqin Zhang

Public Utilities Commission:

Cheryl Lee
Eugene Cadenasso
Judith Iklé

Cal Fire:

Cathy Bleier

CalRecycle:

Clark Williams
Jacques Franco

California Environmental Protection Agency:

John Blue

California Regional Water Quality Control Board:

Robert Crandall

Department of Food and Agriculture:

Casey Walsh Cady

Water Resources Control Board:

John Menke

California Biomass Collaborative:

Garrett Liles
Jackie Button
Mark Jenner
Martha Gildart
Ricardo Amon
Rob Williams
Stephen Kaffka

San Joaquin Valley Air Pollution Control District:

Dave Warner

South Coast Air Quality Management District:

Mohsen Nazemi

PREFACE

Executive Order S-06-06 commits California to a target of generating 20 percent of the state's renewable energy from biopower (biomass to electricity) by 2010 and maintaining this ratio through 2020. Executive Order S-06-06 also commits the state to a target of producing 20 percent of its biofuel use (biomass-based transportation fuels) within the state by 2010, 40 percent by 2020, and 75 percent by 2050.

To achieve the targets in Executive Order S-06-06, the California Energy Commission developed the *2006 Bioenergy Action Plan* and is now updating that plan with the *2011 Bioenergy Action Plan*. Energy Commission staff prepared the *2011 Plan* with input from a group of state agencies identified as the Bioenergy Interagency Working Group and with support from the California Biomass Collaborative. Stakeholders and other members of the public were given the opportunity to review the plan at two public workshops held at the Energy Commission on June 3, 2010, and December 14, 2010.

The *2011 Bioenergy Action Plan* also support the goals targeted in Governor Brown's Clean Energy Jobs Plan to increase renewable generation in California. Bioenergy has the potential to provide green jobs in rural communities, localized small-scale distributed generation, and on-farm and on-dairy renewable energy. The *2011 Plan* also identifies state agency actions intended to reduce the cost of permitting new facilities, streamline the permitting process, and help developers gain access to permitting guidance and agency contact information. The Plan also identifies state agency actions similar to those in Governor Brown's policy directives such as implementation of feed in tariff programs, support for bioenergy developers and small power producers, coordination and review of regulatory processes to reduce permitting burdens, and to create new jobs through clean energy and innovation.

The *2011 Bioenergy Action Plan* identifies:

- Bioenergy and biofuel production increases needed to meet the goals established by Executive Order S-06-06.
- The role of the Bioenergy Interagency Working Group.
- Actions that state agencies will take to support reaching those goals.
- Dates when agencies will complete those actions.

In Executive Order S-06-06, Governor Schwarzenegger ordered that the Secretary for the California Resources Agency and the Chair of the Energy Commission "shall coordinate oversight of efforts made by state agencies to promote the use of biomass resources," and identified agencies that "shall continue to participate on the Bioenergy Interagency Working Group chaired by the Energy Commission." He also ordered that "[t]he Energy Commission shall report to the Governor and the State Legislature through its Integrated Energy Policy Report, and [biennially] thereafter, on progress made in achieving sustainable biomass development in California." However, state agencies cannot achieve the state's bioenergy targets on their own. The Bioenergy Interagency Working Group will continue to meet as its member agencies carry out their responsibilities. These meetings will provide a public forum for stakeholders to track progress, provide input, and participate in the implementation of the *2011 Bioenergy Action Plan*.

ABSTRACT

California's first *Bioenergy Action Plan* was published in 2006 to implement Executive Order S-06-06. That order set goals for the production and use of electricity and fuels made from sustainable biomass sources, including plant and animal residues from farms, forests, and urban areas. The *2011 Bioenergy Action Plan* is an update of the *2006 Bioenergy Action Plan*.

The California Energy Commission prepared the *2011 Bioenergy Action Plan* with input from a group of state agencies identified as the Bioenergy Interagency Working Group, and with technical assistance from the California Biomass Collaborative. The *2011 Plan* identifies challenges to the development of facilities that generate electricity or produce fuel from biomass and identifies actions that state agencies will take to address those challenges.

Keywords: California Energy Commission, Bioenergy Interagency Working Group, bioenergy, biopower, biofuels, biomass, biorefinery, biogenic, Bioenergy Action Plan, renewable

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EXECUTIVE SUMMARY

Introduction

Bioenergy is energy produced from biomass in the form of electricity (biopower), renewable gas (biogas, biomethane, or synthetic natural gas), or liquid transportation fuels (biofuels). In California, biomass feedstock used for bioenergy production is generally limited to organic, non-fossil residues from farming, food processing, timber harvesting, wildfire reduction, energy crops, urban wood waste, and other urban processes.

Increased bioenergy production and use of sustainable biomass can provide a range of economic and environmental benefits. Bioenergy can reduce the state's dependence on foreign oil or imported natural gas, while diversifying the state's energy supply and improving energy security. Bioenergy creates green jobs, enhances rural economic development, and promotes local economic stability. Using biomass from wildfire fuel reduction and agricultural residues can reduce the occurrence of large costly wildfires, protect watersheds and ecosystems, provide an alternative to open field burning, and increase the efficiency and profitability of forestry and farming. Sustainable use of these residues has additional lifecycle benefits, including improved local air quality and public health, reduced greenhouse gas emissions, and reducing the amount of waste buried in landfills.

Purpose

Recognizing the benefits and the contribution that bioenergy could make to achieve California's renewable energy goals, Governor Schwarzenegger signed Executive Order S-06-06 on April 25, 2006. This order committed California to expanding the sustainable use of bioenergy by establishing the following targets:

- The state should produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050.
- The state should meet a 20 percent procurement target for biopower within the established state goals for renewable generation for 2010 and continuing through 2020.

In response to the Executive Order, the Bioenergy Interagency Working Group (Working Group) drafted the first plan, *Bioenergy Action Plan for California*, in 2006 (*2006 Plan*). This plan identified 63 actions to be undertaken. However, in some cases, other priorities took precedence and progress was made on fewer than 40 actions, and even fewer were completed. In the *2009 Integrated Energy Policy Report*, the Energy Commission recommended updating the actions in the *2006 Plan* to reflect current challenges facing bioenergy development.

The *2011 Bioenergy Action Plan (2011 Plan)* was drafted to build upon the *2006 Plan* by addressing current opportunities and challenges that face the bioenergy industry. It also identifies actions that agencies in the Working Group are taking or will be taking over the next two years, to help achieve the state's bioenergy goals. The *2011 Plan* identifies legislative and regulatory actions intended to streamline permitting, facilitate bioenergy development, support research and development of new technologies, increase use of organic material from waste streams, and preserve and create jobs in rural communities.

Key Findings and Recommendations

Consistent with Executive Order S-06-06, the *2011 Plan* identifies a number of key findings:

1. California has abundant biomass resources from the state's agricultural, forest, and urban waste streams. Increasing the state's bioenergy production will help California achieve the state's renewable energy and climate change goals with a sustainable and dependable resource.
2. Bioenergy has many benefits, both as a renewable energy source and an alternative disposal option for biomass. The benefits of bioenergy include displacing fossil fuels with a dependable renewable resource, providing distributed energy near demand, reducing greenhouse gas emissions, and providing green jobs in rural communities. The use of biomass has added benefits to surrounding communities by providing agriculture, industry, and forestry an alternative disposal option for biomass residues, indirect jobs needed to collect and transport the biomass, reduced demand on landfills, and improved water quality and ecosystem health.
3. Market-based pricing mechanisms for electricity, transportation, and waste management do not currently consider all of the benefits bioenergy provides to local communities.
4. Electric grid interconnection challenges have inhibited the development of distributed or community-level energy projects in rural areas, including bioenergy projects. California must address these challenges to increase development of bioenergy projects.
5. The cost to collect and transport biomass feedstock remains an economic challenge to the development of bioenergy projects in California.
6. Regulatory uncertainty continues to reduce options to finance projects in the predevelopment stage, further inhibiting the development of bioenergy and other distributed energy projects.
7. Efforts to streamlining the permitting process, especially for anaerobic digesters using dairy and urban waste, continue to be supported by state agencies, local air districts, regional water control boards, and the United States Environmental Protection Agency. However, additional actions will be needed by the Working Group and the Legislature to streamline permitting for distributed energy projects.

The *2011 Plan* recommends a series of actions to be taken by state agencies. The actions have been organized around the following key recommendations:

1. The State Legislature should revisit the restrictions imposed on the use of conversion technologies to convert post-recycled urban-derived biomass and municipal waste to energy.
2. Greater coordination among permitting agencies is needed to reduce the permitting timeframe and costs to developers. The Working Group will take additional steps to expedite permits through program environmental impact reports and creating a Web-based portal for permit contacts. The Working Group recommends the Legislature consider options to streamline the state's permitting process to further expedite the permitting process in California.

3. The California Public Utilities Commission should review the interconnection requirements for distributed generation projects and biogas quality standards and identify and implement necessary revisions to regulations that will increase access to the electricity transmission and distribution grid and natural gas pipeline for distributed generation projects, including bioenergy projects.
4. The economics of biomass development should be enhanced through a series of state incentives that recognize the benefits of biomass. These incentives could include, but are not limited to, expanding feed-in tariffs, support for repowering aging biopower facilities, feedstock incentives, environmental adders, more favorable power purchase agreements, and research and development grants.
5. The development of sustainable feedstock standards for biomass feedstock can ensure that biomass removal, especially on California's forestlands, does not harm the environment.
6. In cooperation with other state agencies, the Energy Commission should continue to monitor progress toward achieving the state's bioenergy goals through the Working Group.

State Policy Context

The actions identified in the *2011 Plan* support the California Clean Energy Future Plan and Governor Brown's energy policy priorities articulated in his Clean Energy Jobs Plan. As required in Executive Order S-06-06, the Energy Commission is responsible for coordinating state actions to increase the sustainable development and use of California's biomass resources. The Order directs the Energy Commission to report biennially on progress toward achieving sustainable biomass development in its *Integrated Energy Policy Report (IEPR)*.

As part of its *2011 IEPR*, the Energy Commission will develop a Strategic Plan for Increasing Renewable Generation and Transmission Infrastructure in California. The *2011 Plan* will serve as an important input to the *2011 IEPR*, informing stakeholders of the challenges and opportunities for developing bioenergy projects in California.

Governor Brown's Clean Energy Jobs Plan calls for the state to increase renewable capacity by 20,000 megawatts (MW) by 2020. Governor Brown's target includes 12,000 MW of energy located on-site and close to where energy is consumed (distributed generation) and 8,000 MW of new large-scale renewable energy. Biopower has the potential to provide between 2,000 and 5,000 MW of the localized renewable capacity needed to achieve the Governor's goals.

The Renewables Portfolio Standard requires retail sellers of electricity to increase the amount of renewable energy they procure each year by at least 1 percent until 20 percent of their retail sales are served with renewable energy by December 31, 2010. Flexible compliance rules extend this deadline to the end of 2013. Retail sellers include investor-owned utilities, electric service providers, and community choice aggregators. Publicly owned utilities are required to set their own renewable targets. On September 23, 2010, the Air Resources Board adopted the Renewable Electricity Standard. After the regulation goes into effect, the Renewable Electricity Standard will require state's load-serving entities, including both retail sellers and publicly owned utilities, to meet a 33 percent renewable energy target by 2020.

On the biofuels side, the Air Resources Board adopted the Low-Carbon Fuel Standard in 2009, which will reduce greenhouse gas emissions by requiring the reduction of the carbon intensity of transportation fuels used in California by an average of 10 percent by 2020. Low-carbon biofuels, such as compressed biomethane, will play an important role in achieving this target.

Despite aggressive state policies to promote renewable energy and bioenergy, progress toward achieving the state's bioenergy goals has been slow. Many new facilities were proposed and constructed and some idle facilities restarted following the *2006 Plan*. However, existing facilities continued to shut down, most proposed facilities were not constructed, and many of the new facilities were idled. By 2011, most of the biopower capacity gains were lost due to adverse market conditions, high fuel costs and, in some cases, competition with fossil fuels.

Objectives of the *2011 Bioenergy Action Plan*

To achieve California's bioenergy goals, some existing facilities will need to be retooled, expanded, or restarted and new facilities will need to be constructed. The *2011 Plan* identifies five objectives for achieving the state's bioenergy goals. These five objectives are:

1. Increase bioenergy production at existing facilities. Restarting idle plants, repowering existing facilities, or switching from fossil-based feedstock to bio-based feedstocks can cost-effectively increase bioenergy production at existing facilities without developing new projects and land.
 - Continued operation of existing bioenergy facilities will reduce the number of new facilities needed to achieve the state's bioenergy and renewable energy goals.
2. Construct new bioenergy facilities.
 - Although the number of bioenergy facilities needed to meet California's bioenergy goals will depend on the output from existing facilities, to meet the state's bioenergy goals, new projects must be developed.
 - Total in-state bioenergy production is limited by the amount of biomass harvestable using existing technologies (technical potential) and affordable to bioenergy producers (economically recoverable). The California Biomass Collaborative estimates that the amount of biomass feedstock that is technically available for energy production is 36 million bone dry tons per year (BDT/yr) in 2010 and 40 million BDT/yr in 2020.
 - In terms of power generation, the net technical potential (net of known demand) is 34,300 gigawatt-hours (GWh) in 2010 and 44,300 GWh in 2020. In terms of fuel production, the net technical potential is 1,060 million gasoline gallon equivalents (gge) in 2010 and 1,370 million gge in 2020. However, of the amount that is technically available, only a portion will be economically recoverable. Identifying the amount that is economically available requires an in-depth assessment of site-specific constraints.
 - The Energy Commission estimates that demand for ethanol could increase to more than 3 billion gallons (2 billion gge) per year by 2022, while biodiesel could increase to more than 135 million gge per year. The environmental analysis of Air Resources Board's Initial Statement of Reasons to implement the Low-Carbon Fuel Standard

- Regulation estimates that 18 cellulosic biorefineries, 6 corn-ethanol biorefineries, and 6 new biodiesel or renewable diesel refineries could be needed by 2020 to meet the increased demand for low-carbon biofuels. Total in-state biofuel production could be as high as 2.3 billion gallons (1,540 million gge) in this scenario.
3. Integrate bioenergy facilities with biomass collection, processing, and treatment operations, and use multiple fuels in bioenergy plants.
 - Numerous synergistic opportunities exist between biopower and biofuel production and value-added bioproducts across industrial, agricultural, forestry, waste collection, and organic-materials processing activities. Combined or integrated bioenergy facilities hold great promise to increase efficiency and provide a model of how researchers can extract more energy and value from existing biomass resources, altering the current economic relationship to levels that make these relationships both economically viable and of increasing value to society.
 4. Commercialize next generation conversion technologies.
 - Promotion of next-generation technologies can help California successfully meet a diverse set of goals, including those associated with energy security and diversification, greenhouse gas mitigation, rural economic development, and other environmental issues. Next-generation technologies include both thermochemical and biochemical conversion processes that use a wide range of feedstocks. Each technology has unique challenges to commercialization that must be addressed. Some of these technologies have the potential to reduce air emissions from small distributed generation projects and increase the range of feedstock types compatible with energy and fuel production.
 5. Remove statutory hurdles and streamline regulatory process.
 - Some California statutes contain restrictive language that may limit the use of urban derived biomass for the production of energy. In addition, numerous utility rules and state and local regulations and policies apply to project developers and operators of bioenergy facilities. Improving flexibility in state statutes and increasing coordination among regulators and policy makers would encourage development of bioenergy facilities. Permitting assistance for project proponents of new and emerging technologies would facilitate the growth of the biomass industry in California.

Economic Development

The production and use of biomass for energy production can improve California's economy, especially in rural communities, by creating green jobs and reducing the disposal costs for biomass residuals. Achieving the state's bioenergy goals has the potential of adding over 15,000 jobs in California's rural communities over the next 10 years.

Bioenergy facilities offer agricultural, forestry, and urban communities an alternative disposal option for organic waste. Some communities are phasing out traditional disposal options, such as open-field burning and landfills owing to their impact on public health and the environment and lack of space for new landfills in urban areas. A robust bioenergy industry will provide a

dependable disposal option for farms, dairies, food producers, and others and mitigate the economic impact to these industries as other disposal options are phased out.

Implementation of the 2011 *Bioenergy Action Plan*

There are a large number of challenges facing bioenergy development in the state. For example, existing facilities face economic challenges related to the cost of feedstock collection and transportation versus the price received for energy production, and new project developers must economically meet state and local permitting requirements in a capital-constrained financial market.

Given the numerous challenges facing bioenergy, the *2011 Plan* does not attempt to overcome every obstacle to bioenergy development. Instead, the Working Group built on the *2006 Plan* and identified actions that state agencies can feasibly undertake by December 2012, using existing state resources, to further refine the state's bioenergy policies and lead to a meaningful increase in bioenergy development.

Recognizing that additional state actions may be needed to achieve the *2011 Plan's* objectives and, ultimately, the state's bioenergy goals, Energy Commission staff will hold a public workshop in 2011 to discuss recommendations for additional actions for the Working Group to consider as resources become available.

Energy Commission staff will lead implementation of the *2011 Plan* and will convene the Working Group quarterly to discuss and update the plan's objectives and the status of each agency's actions. As appropriate, the Working Group will include other state agencies, local air districts, stakeholders, and environment groups in the process of implementing this plan.

Energy Commission staff will monitor progress by tracking completion of the actions assigned in the plan. In addition, Energy Commission staff will track the amount of new biopower generation and biofuel production each year. Successful implementation of the plan will require completion of the plan's actions and achievement of the state's bioenergy goals.

CHAPTER 1:

Introduction

Bioenergy is energy produced from biomass. Biomass includes plant or animal residues produced on farms and in forests, crops grown specifically to produce energy (energy crops), and urban-derived materials. Bioenergy comes in many forms, including electricity, heat, gas (methane or synthetic natural gas), and liquid transportation fuels. Biopower, electricity generated from biomass, is renewable, and supports the current “baseload” or other continuous energy demand; whereas other renewable energy sources like wind and solar are intermittent renewable energy sources that may or may not coincide with periods of peak consumer or industrial demand. Biomethane is gas produced from digested biomass or biogas and can replace natural gas in homes and factories, replace compressed natural gas used in vehicles, or produce renewable hydrogen in fuel cells. Biofuels such as ethanol and biodiesel can be used as alternative transportation fuels.

In California, renewable biomass feedstock (with the exception of energy crops) is generally limited to residues from industrial, agricultural, mill, and forestry projects and other biogenic waste materials. State agencies are working together to ensure that all current and future forest biomass harvest activities conducted for bioenergy production are sustainable and ensure protection of California forests.

The increased production and use of sustainable bioenergy can provide a range of economic and environmental benefits. Bioenergy can reduce the state’s dependence on foreign oil and imported natural gas, while diversifying the state’s energy supply and improving energy security. Bioenergy creates green jobs, enhances rural economic development, and promotes local economic stability. Using biomass from wildfire fuel reduction activities and agriculture residues can reduce the occurrence of large costly wildfires, protect watershed and ecosystem, provide an alternative to open field burning, and increase the efficiency and profitability of forestry and farming. More efficient use of these residues has additional lifecycle benefits, including improved local air quality and public health, reduced emissions of greenhouse gases, and reducing the amount of waste buried in landfills.

California’s Bioenergy Goals

Senate Bill 107, enacted in 2006,¹ requires retail sellers of electricity regulated by the California Public Utilities Commission (such as investor owned utilities) to procure renewable power. SB 107 requires that, by 2010, 20 percent of the total electricity sold by retail sellers in California come from renewable energy resources, such as wind, solar, geothermal, and biomass. Flexible compliance rules extend this due date to the end of 2013.² The statute also requires publically owned utilities to set their own renewable goals.

¹ Senate Bill 107, Simitian, Chapter 464, Statutes of 2006.

² CPUC, “Renewables: Compliance and Reporting,”
<http://www.cpuc.ca.gov/PUC/energy/Renewables/compliance.htm>

Assembly Bill 32, enacted in 2006,³ directs the California Air Resources Board (ARB) to develop discrete early actions and prepare a scoping plan to reduce greenhouse gases (GHG) to 1990 levels by 2020.

Recognizing the contribution that biomass could make to achieve the state's renewable energy and GHG reduction goals, Governor Schwarzenegger signed Executive Order S-06-06 on April 25, 2006. This order committed California to expanding the sustainable use of bioenergy by setting the following state targets:

- The state should produce a minimum of 20 percent of its biofuels within California by 2010, 40 percent by 2020, and 75 percent by 2050.
- The state should meet a 20 percent procurement target for biopower within the established state goals for renewable generation for 2010 and continuing through 2020.

In 2008 and 2009, Governor Schwarzenegger signed Executive Order S-14-08 raising the state's overall renewable electricity goal to 33 percent by 2020, and Executive Order S-21-09, directing the ARB to adopt a regulation, requiring the state's load serving entities to meet this target by 2020. The ARB adopted the Renewable Electricity Standard on September 23, 2010. After this regulation goes into effect, the Renewable Electricity Standard will require the state's load-serving entities to meet a 33 percent renewable energy target by 2020.

On the biofuels side, the ARB adopted the Low-Carbon Fuel Standard in 2009, which will reduce GHG emissions by reducing the carbon intensity of transportation fuels used in California by an average of 10 percent by 2020. Biofuels will likely play a role in achieving this target.

Table 1-1 summarizes the goals established by Executive Order S-06-06.

Table 1-1: Executive Order S-06-06 Bioenergy Goals

Biopower (GWh)⁴		Biofuel Production (million gge)⁵	
2009 Generation	6,400	2009 Production	48
2010 Goal	7,200	2010 Goal	135
2020 Goal	17,000 -20,000	2020 Goal	850

Source: California Energy Commission

Governor Brown's Energy Policies

Governor Jerry Brown's Clean Energy Jobs plan calls for the state to increase renewable energy capacity by 20,000 megawatts (MW) by 2020. Governor Brown target includes 12,000 MW of localized energy located on-site and close to where energy is consumed (distributed generation)

³ Assembly Bill 32, Nuñez, Chapter 488, Statutes of 2006.

⁴ GWh is gigawatt hours.

⁵ gge is gallons of gasoline equivalent.

and 8,000 MW of new large-scale renewable energy. Biopower has the potential to provide between 2,000 and 5,000 MW of localized renewable energy to achieve the Governor's goals.

Bioenergy can help achieve Governor Brown's energy goals and provide reliable green jobs in rural communities. Specifically, bioenergy can directly support the following elements of the Governor's plan:

- Biopower is a baseload energy source that has benefits other than displacing fossil generation. Biopower also provides an alternative disposal option for communities with forest, agricultural, and other biogenic residues. In general, the traditional disposal options include open-field burning, sending the material to a landfill, or applying this material on rural land.
- The Governor proposes creating a "strike team" to focus on job creation and job retention. The strike team would work as a liaison between various state and local permitting agencies, work with the federal government to leverage federal research money, and work with business to address challenges. The Bioenergy Interagency Working Group operates similarly to the Governor's "strike team." The Working Group continues to work with the biomass industry to respond to inquiries, address regulatory hurdles, streamline permitting, facilitate bioenergy development, and act as a liaison between different state and local permitting agencies.
- The Governor proposes reducing the permitting time for renewable projects by developing CEQA guidelines. The *2006 Bioenergy Action Plan* called for the development of two program Environmental Impact Reports or CEQA guidelines for biogas digester technologies using dairy manure (Water Board) and anaerobic digesters using other waste feedstocks (CalRecycle). The purpose of these reports was to streamline the permitting of anaerobic digester projects in California. In support of the Governor's priorities, the *2011 Plan* contains additional agency actions designed to reduce developer costs associated with permitting a new bioenergy facilities.
- The Governor's plan calls on the state to take all reasonable steps to promote the development and use of advanced biofuels – transportation fuels from algae, agricultural waste and biodiesel, and provide incentives to California's cutting-edge industries that are developing advanced biofuels. The *2011 Plan* identifies actions that will be taken or are being taken to advance research and development of advanced biofuels through the PIER program, provide funding through California's *Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program* (AB 118 program), and state policies to promote the use of low-carbon biofuels through the Air Resources Board's Low-Carbon Fuel Standard.
- The Governor plans to explore development of compatible renewable energy facilities on California farms. The *2011 Plan* outlines opportunities and challenges to the increased use of bioenergy technologies on farms and dairies. The Plan also identifies state actions to address the challenges

The *2011 Plan* also contains information and recommendations regarding additional policies, programs, incentives, and research and development programs needed to facilitate the development of California's bioenergy industry.

Economic Development

The production and use of biomass for energy positively impacts California's economy, especially in economically struggling, rural agricultural communities. Unique among renewable energy sources, bioenergy production depends on a consistent supply of feedstock and requires more full-time labor than other technologies. Achieving the state's bioenergy goals could potentially add over 15,000 full-time jobs, positively affect economic activity, and encourage economic development in rural areas, and throughout the state.

With this development in mind, Executive Order S-06-06 sets a target for California's Renewables Portfolio Standard to be comprised of at least 20 percent biopower. Achieving this goal will add between 11,000 and 14,000 full-time jobs over the next 10 years jobs in California's rural communities.^{6 7}

Furthermore, E.O. S-06-06 requires an escalating percentage of California's biofuel demand to be produced in state, with 40 percent of production in-state by 2020. According to the U.S. Department of Energy's Jobs and Economic Development Impact (JEDI) model, a new cellulosic ethanol production facility with an output of 45 million gallon/year will add 760 full-time jobs to California's economy during the construction of the facility and 210 permanent full-time jobs to maintain plant operation.⁸ Achieving the state's biofuel target with cellulosic ethanol facilities could add up to 6,000 full-time jobs over the next 10 years.

Bioenergy also provides agricultural, forestry, and urban communities a low cost alternative to organic waste disposal. Traditional disposal options, such as open-field burning and near-by landfills, are slated to be phased out of some communities owing to their impact on public health and the environment. A fully developed bioenergy industry will provide a dependable disposal option that will mitigate the economic impact of the ban on open-field burning and closure of near-by landfills on farmers, dairies, and food producers.

Increasing the amount of distributed bioenergy in California will create local, rural jobs to construct biomass processing facilities, provide consistent feedstock, and maintain facility operation.

6 The total employment gains are estimated to be 4.9 full-time jobs per megawatt of new biopower capacity. Source: G. Morris. 1999. *The Value of the Benefits of U.S. Biomass Power* - NREL/SR-570-27541. Green Power Institute. Page 12.

7 Energy Commission staff estimate that 2,200 MW to 2,900 MW of additional biopower capacity is needed to achieve the goals in E.O. S-06-06 in 2020 assuming a 33 percent by 2020 RPS making the biomass electricity generation target 17,000-22,000 GWh in 2020. Also assumes an 85 percent capacity factor.

8 NREL JEDI model 2010. The model assumes the construction phase will provide full-time positions for three years and does not include the economic impact of plant profit spending and other external benefits.

What Is the Bioenergy Action Plan?

California's first *Bioenergy Action Plan for California (2006 Plan)* was published in 2006 to implement Executive Order S-06-06. The *2006 Plan* listed 63 actions to be taken by a variety of state agencies to increase the production and use of bioenergy in California. The Bioenergy Interagency Working Group (Working Group) developed the *2006 Plan*. James D. Boyd, Vice Chair of the Energy Commission, chairs the Working Group, which includes representatives from the following state agencies: the California Air Resources Board, California Department of Forestry and Fire Protection (Cal Fire), California Department of Resources Recycling and Recovery (CalRecycle), the California Environmental Protection Agency (CalEPA), the California Department of Food and Agriculture, the Department of General Services, the Natural Resources Agency, the California Public Utilities Commission, and the Water Resources Control Board. The California Biomass Collaborative managed by UC Davis provided *ex-officio* support.

The Energy Commission's *2009 Integrated Energy Policy Report* recommended that the "Bioenergy Action Plan . . . be updated in 2010 to address opportunities and "continuing barriers to the development and deployment of bioenergy."⁹ In addition, the Energy Commission's *Progress to Plan* found that "progress towards meeting California's ambitious bioenergy goals has been slow, and in some cases, the state is losing ground . . . Without major initiatives to make legislative and regulatory changes, and state and federal financial incentives and policies that recognize the benefits of using 'waste' material for energy, California will fall far short of . . . [its bioenergy] goals."¹⁰

The 2011 Bioenergy Action Plan

The *2006 Plan* was developed to further promote bioenergy development in California through broad-based policy goals and state actions. The *2011 Bioenergy Action Plan (2011 Plan)* builds on the policies and programs implemented as a result of the *2006 Plan* and identifies actions that further refine California's bioenergy policies and programs that were implemented following the *2006 Plan*.

The *2011 Plan* was developed by identifying current opportunities and challenges that face the bioenergy industry. The Energy Commission worked with the Working Group to identify actions that the agencies could take within the next two years to address these challenges and help achieve the state's bioenergy goals. The plan also identifies legislative and regulatory changes that may be needed.

The *2011 Plan*:

- Identifies agency and department programs, regulations, policy, and legislative actions to help achieve the goals established by Executive Order S-06-06.
- Identifies expected completion dates of each action.

9 Orta, Jason, Zhiqin Zhang, and et. al. 2010. *2009 Progress to Plan – Bioenergy Action Plan for California*. California Energy Commission. CEC-500-2010-007. Page 233.

10 Ibid. Page 1.

- Defines the role for the Working Group in overseeing implementation of the *2011 Plan* and provides a schedule for its implementation.
- Proposes a continuing process to monitor, measure, and report progress toward California's biopower and biofuel goals.

Each agency in the Working Group has committed to implement actions within its jurisdiction.

The Working Group will meet quarterly to monitor, measure, and report the progress of implementing the *2011 Plan*. The Energy Commission will also measure progress toward achieving the state's overall bioenergy goals. As required by the Executive Order, the status of bioenergy development in California will be included in the Energy Commission's *Integrated Energy Policy Report*, and the *2011 Plan* or its actions will be revised as needed to reflect progress and current conditions.

Task-Specific Work Plans

Achieving the state's bioenergy targets will require that state agencies coordinate with stakeholders to develop and implement plans to achieve specific goals for energy production. Such plans are referred to as "task-specific work plans" and provide a greater level of detail than the *2011 Plan* does. In particular, task-specific work plans may contain the following information:

- A discussion of the relationships and dependencies between actions identified in the plan.
- Numeric energy production goals related to completion of specific tasks.
- A time-line that indicates when particular actions will be completed.
- The individuals responsible for completion of sub-tasks and the primary task.
- Funding that will be used to support specific tasks or the overall effort.

Task-specific work plans involving multiple stakeholders are generally developed by a workgroup formed specifically for that purpose. Once a work plan is developed, the workgroup may continue to meet to coordinate and expedite implementation of the plan. Since the participants in such workgroups often do not have shared management and authority, an essential initial step in developing the workgroups is establishing communication to ensure that all participants meet their commitments.

The Energy Commission will assist state agencies and other stakeholders in forming workgroups to develop and implement task-specific work plans in support of the *2011 Plan*. The California Biomass Collaborative will also participate in establishing workgroups and disseminating information on ongoing efforts. The Energy Commission and the California Biomass Collaborative will coordinate efforts to identify task-specific workgroups and to track progress in implementing task-specific work plans.

CHAPTER 2:

Status of Bioenergy in California

California's first *Bioenergy Action Plan for California (2006 Plan)* was published in 2006 to implement Executive Order S-06-06. The Working Group completed, or made progress on approximately 40 of the actions identified in the *2006 Plan*. However, despite partial implementation of the *2006 Plan*, bioenergy development in California still faces many of the same challenges that existed in 2006, such as high cost of development, competition for biomass feedstock, the high cost of fuel delivery, and legal and permitting hurdles. As a result, progress toward achieving the goals in Executive Order S-06-06 has been slow.

The working group completed actions identified in the *2006 Plan* to streamline the permitting process for anaerobic digesters, and develop state programs and policies that promote the development of bioenergy projects.

Status of Biofuels

Biofuel¹¹ production in California is predominantly ethanol derived from corn grain from Midwest farms, and biodiesel derived from waste grease and tallow and some imported virgin oils, including palm oil; however, other fuels such as biomethane, "drop-in" biomass-derived hydrocarbons (renewable diesel and gasoline components), and renewable hydrogen are being developed by the industry. In 2008, California consumed approximately 1 billion gallons (680 million gge) of biofuel, primarily as ethanol blended in gasoline as an oxygenate (950 million gallons or 640 million gge).¹² To meet California's in-state biofuel production targets in Executive Order S-06-06, the state would need to produce nearly 200 million gallons (135 million gge) of biofuel per year in 2010¹³ and up to 1.28 billion gallons (850 million gge) per year in 2020,¹⁴ a range of 3 to 17 times the estimated 48 million gge of biofuels that were produced in 2009.

California has 166 million gge of annual ethanol production capacity, with only 21 million gge produced in 2009. Since 2000, five corn ethanol refineries have been built in California. All five of these plants were idle most of 2009 and 2010 due to adverse market conditions. Only one of these corn ethanol refineries produced fuel in 2010. Total in-state biodiesel capacity is capable of producing 92 million gge per year. However, less than 27 million gge were produced in 2009. Table 2-1 summarizes the biofuel production and capacity in California.

11 The term "biofuel" is used to describe liquid transportation fuels in the *2011 Bioenergy Action Plan*. The *2011 Plan* uses the term biomass to describe organic feedstock and biogas to describe gaseous sources.

12 Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF. Page 57.

13 Assuming ethanol demand continues to be the primary source of biofuel demand in California.

14 Under the federal RFS2, California's "fair share" consumption of renewable fuels may be as high as 3 billion gallons per year in 2022. Assuming this is met entirely with first generation and advanced biofuels in 2020, California would need to produce 40 percent (1.2 billion gallons per year) of these fuels in state.

In-state biofuel production will make up just 5.8 percent of California’s estimated 1 billion gge biofuel demand in 2009, far below the 2010 biofuel goal of 20 percent (200 million gge).¹⁵

Table 2-1: Summary of In-State Biofuel Production Capacity

Fuel Type	2009 Production (million gge / yr)	Total Installed Capacity[†] (million gge / yr)	Proposed Projects (million gge / yr)
Ethanol	21	166	20
Biodiesel	27	92	30
Biomethane [‡]	n/d	8	6
Total Biofuels	48	266	56

Source: California Energy Commission

[†] Includes in-state production capacity that is currently idle.

[‡] No data available on 2009 production of biomethane.

State and Federal Programs Boost Biofuels

Arguably, the greatest potential impact from the *2006 Plan* will be in the biofuel sector with the adoption of Low-Carbon Fuel Standard (LCFS) and implementation of the *State Alternative Fuels Plan*. The LCFS requires fuel refiners, blenders, producers, and importers to reduce the carbon intensity of the transportation fuels they produce by at least 10 percent by 2020. See Governor’s Executive Order S-01-07 dated January 18, 2007.

The ARB adopted the LCFS by regulation on April 23, 2009. Renewable, low-carbon biofuels will play a significant role in meeting GHG reduction targets in the initial years of the LCFS. The LCFS requires fuel suppliers and blenders to produce or secure low-carbon fuels, creating higher demand for biofuels. The LCFS will also support the migration of these facilities toward improved production efficiencies and the use of agricultural and forest-based waste streams and sustainably produced low-carbon bioenergy crops.

“The LCFS will reduce GHG emissions from the transportation sector in California by about 16 million metric tons in 2020. The LCFS establishes performance standards that fuel producers and importers must meet each year beginning in 2011. One standard is established for gasoline and the alternative fuels that can replace it. A second similar standard is set for diesel fuel and its replacements. Each standard is set to achieve an average 10 reduction in the carbon intensity of the statewide mix of transportation fuels by 2020.”¹⁶

Assembly Bill 118 (AB 118), created the Alternative and Renewable Fuel and Vehicle Technology Program.¹⁷ Administered by the Energy Commission, this program is allocated up to \$120 million annually to provide grants, loans, or loan guarantees to public agencies,

15 Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program* Commission Report. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF.

16 California Air Resources Board. 2009. Staff Report: Initial Statement of Reasons for Proposed Regulation to Implement the Low Carbon Fuel Standard.

17 Assembly Bill 118 Núñez, Chapter 750, Statutes of 2007.

businesses, public-private partnerships, consumers, and academic institutions. The purpose of the program is to develop and deploy innovative technologies that transform California's fuel and vehicle types to help achieve the state's climate change goals.

In-state biofuels production has declined recently, mostly due to poor economics caused by relatively low gas and diesel prices and medium-high corn prices. Lack of capital and debt financing are also impeding biofuel plant development and upgrades. In addition, regulatory uncertainty at the state and national level interact to limit investment. The AB 118 program leverages public and private investment to make price supports and financing more readily available to California's existing and planned biofuel production facilities with the goal of increasing production and achieving California's biofuel production goals.

In the 2008-2009 *Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program*, the Energy Commission allocated about \$40 million to biofuels, and of that amount, has recommended that \$21.5 million be spent on four biomethane projects. These projects are anticipated to displace more than 13 million gallons of gasoline equivalent (gge). The Energy Commission also held an additional funding solicitation with approximately \$15 million available for biofuels production in California; the announcement of proposed awardees is currently pending. Additionally, the 2010-2011 *Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program* allocates more than \$20 million for the production of biofuels as well as \$13.5 million for infrastructure to support this production. As the AB 118 program continues to fund projects, program evaluation efforts will take place to determine how funded projects are progressing, to identify key obstacles and challenges, and to make recommendations for future actions.

The federal Renewable Fuel Standard (RFS2) calls for the production of 21 billion gallons of advanced biofuels (from renewable, non-food derived biomass, such as, cellulosic materials and non corn grain crops including sugar cane and crop residues) by 2022. In addition, federal stimulus funds have been awarded to biofuel producers. These federal actions either directly or indirectly help California's biofuel production. The Energy Commission estimates that demand for renewable fuel in California will triple between now and 2022 to meet the Energy Commission's current gasoline demand forecasts and the "fair share" renewable fuel use requirements of the federal RFS2.¹⁸

Status of Biopower

Existing Generation

Biopower in California is predominately generated by solid-fuel biomass and landfill gas facilities. Energy Commission staff estimates that the total in-state biopower used to meet in state demand for electricity was 6,400 gigawatt hours (GWh) in 2009,¹⁹ including on-site

18 Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF. Page 57.

19 2009 Total California In-State Power Generation.
http://www.energyalmanac.ca.gov/electricity/total_system_power.html

generation.²⁰ Although generation used onsite is not counted toward California's renewable goals at this time, the CPUC recently authorized the use of tradable Renewable Energy Credits. Assuming that all existing energy on-site generation will qualify under the new rules, the total biopower generation in 2009 (2009 Biopower Baseline) is 6,400 GWh.²¹ The total biopower generated in 2009 represents 20 percent of total renewable generation reported (32,400 GWh).²²

Biopower Goals

Energy Commission staff estimates that the total renewable generation needed to achieve the 2010 renewable procurement target is 36,000 GWh.²³ This assumes that the utilities meet the state's mandate to procure 20 percent of retail sales with renewables by 2013²⁴ and publicly owned utilities achieve their own renewable energy goals by 2010.²⁵ Based on this estimate, the

20 Data includes 5,700 GWh generated in state and 700 GWh imported. Due to legislative changes required by Assembly Bill 162 (2009), the Air Resources Board is currently undertaking the task of identifying the fuel sources associated with all imported power entering into California. Because data from the ARB was not available, staff used imported generation from the 2008 *Net System Power Report* (NSPR). Note that renewable definitions in the Net System Power program differ slightly from those in the RPS, and in addition, a small portion of the data presented in the 2008 NSPR represents estimates of unidentified imported generation. Therefore, this data should be treated as an estimate only. (Nyberg, Michael, 2009. *2008 Net System Power Report*. California Energy Commission. CEC-200-2009-010. Pages A3 - A6.)

21 The RPS Eligibility Guidebook will need to be revised in order to allow the tracking of RECs from renewable generation used on-site. The revisions would: 1) establish rules to certify renewable distributed generation facilities as eligible for the RPS, and 2) establish verification and tracking rules for renewable distributed generation facilities, whether that is in WREGIS or elsewhere.

22 28,600 GWh (Total renewables 2009 TSP) + 3,700 GWh (2008 NSPR renewable imports) = 32,400 GWh
2008 import generation source: Nyberg, Michael, 2009. *2008 Net System Power Report*. California Energy Commission. CEC-200-2009-010. Pages A3 - A6 and Table 4 on page 10.

23 Load-serving entities under the jurisdiction of the CPUC are required to procure 20 percent of their total procurement with renewables by 2010. Publicly owned utilities are not under the jurisdiction of the CPUC and are required to set their own renewable energy targets. Based on 2010 *Energy Commission Load Forecast* for each load-serving entity, Energy Commission staff estimates the 2010 renewable procurement goal is 36,000 GWh based on individual utility targets. Pumping load contained in the load forecast was excluded from this calculation.

24 The CPUC developed flexible rules for compliance permitting electrical corporations to apply inadequate procurement in one year to not more than the following three years. Electrical corporations may offset any deficit in 2010 with renewable electricity procured through 2013.

25 "California's Renewables Portfolio Standard law requires certain retail sellers of electricity to increase the amount of renewable energy they procure each year by at least 1 percent until 20 percent of their retail sales are served with renewable energy by 2010, but specifically excludes local publicly owned electric utilities from the definition of 'retail seller.' Instead, local publicly owned electric utilities are required to implement a Renewables Portfolio Standard (RPS), but are given flexibility in developing utility-specific targets, timelines, and resource eligibility rules." (KEMA. 2008 *The Progress Of California's Publicly Owned Utilities In Implementing Renewables Portfolio Standards*. California Energy Commission. Publication number: CEC-300-2008-005.)

2010 biopower goal is 7,200 GWh. Therefore, an increase of 800 GWh per year is needed to achieve the state's 2010 biopower goal.

To achieve a 33 percent RPS in 2020, Energy Commission staff estimates that California load serving entities will need to procure between 50,000 and 65,000 GWh of additional renewable generation, depending on assumptions for rooftop solar, energy efficiency, and onsite generation. To achieve the state's 2020 biopower goal of 20 percent renewable procurement, between 10,000 and 13,000 GWh per year of new biopower must come on-line. Table 2-2 summarizes the renewable and biopower goals for 2010 and 2020.

Table 2-2: Summary of Renewable Energy and Biopower Goals (GWh)

Year	Renewable Goal	Biopower Goal	Biopower Baseline (2009)	Additional Biopower Needed
2010	36,000	7,200	6,400	800
2020	86,000 – 100,000	17,000 – 20,000	6,400	10,600 – 13,600

Source: California Energy Commission

California's Biopower Industry

Since 2006, a total of 22 new biopower facilities were built in California, 15 landfill gas²⁶ and 7 digester facilities,²⁷ representing 44 MW of generating capacity. Although no new solid-fuel biomass facilities were constructed, three idle facilities restarted. In addition, an idle coal facility was converted to biomass and restarted during the first quarter of 2010. Lastly, two coal facilities began cofiring with biomass and have plans to fully convert to biomass by 2012. Total bioenergy capacity added since 2006 total 88 MW, representing 500 GWh/year.

The activity since 2006 was not all positive. By the end of 2010 nine solid-fuel biomass facilities were idle, representing 100 MW. The facilities have idled for a various reasons, such as poor economic conditions in the lumber industry and low contract prices for energy. Seven dairy manure digesters also idled because of financial difficulties and, in some instances, difficulties meeting San Joaquin Valley Air Pollution Control District nitrogen oxide (NOx) emission

26 U.S. EPA Landfill Methane Outreach Program.
www.epa.gov/lmop/documents/xls/opprjlmopdata.xls
www.epa.gov/agstar/pdf/digesters_operational.xls

27 Orta, Jason, Zhiqin Zhang, and et. al. 2010. *2009 Progress to Plan – Bioenergy Action Plan for California*. California Energy Commission. CEC-500-2010-007.

standards with purchased equipment. The capacity idled since 2006 is 100 MW,²⁸ which represents the potential to generate 750 GWh per year²⁹ of biopower.

The three largest investor-owned utilities (IOUs) in California have signed contracts with 10 new biopower projects expected to come on-line before 2012. The IOUs estimate that these projects could deliver between 600 and 1,000 GWh per year.³⁰ California publicly owned utilities have signed contracts with 11 new biopower projects expected to come on-line before 2012. The expected deliveries from these projects total 570 GWh per year.³¹ The United States Environmental Protection Agency (U.S. EPA) Landfill Methane Outreach Program shows an additional 5 projects under construction in 2009. Staff estimates the deliveries from these projects will be 250 GWh per year.

The total statewide-expected deliveries from newly contracted projects are 1,400 to 1,800 GWh. If these projects are successful in coming on-line by 2012, and existing generation remains constant, then the state will remain on track for achieving the near-term biopower goal. Table 2-3 summarizes active, idled, and proposed bioenergy projects in California.

Table 2-3: Summary of In-State Biopower Capacity

Technology	Operating Capacity (MW)	Idle Capacity (MW)	Proposed Projects (MW)
Solid-Fuel Biomass [†]	757	139	346
Landfill Gas**	422	-	139
Anaerobic Digester Gas - Dairy*	3.9	4.6	4.3
Anaerobic Digester Gas - Other	60	-	7.9
Biogas Cofiring at Natural Gas Facilities	210	-	359
Unrecovered Municipal Solid Waste (MSW) [§]	75	-	455
Total Bioenergy	1,527	144	1,311

[†] Source: Energy Commission

[§] Includes three MSW combustion facilities, of which, only the Stanislaus Resource Recovery facility is eligible for the RPS. It is unknown whether the proposed MSW conversion facilities will qualify for the RPS.

28 Solid-fuel biomass facilities idle as of 2010 include: Big Valley Lumber Company, Burney Mountain Power, Chowchilla Biomass Facility, El Nido Biomass Facility, Mt Lassen Power, SPI - Anderson/ Sierra Pacific Industries, SPI - Loyalton/ Sierra Pacific Industries, SPI - Sonora/ Sierra Pacific Industries, SPI - Susanville/ Sierra Pacific Industries.

29 Energy Commission. Assumes capacity factor of 85 percent for 100 MW of idle solid fuel biomass, and capacity factor of 60 percent for 1 MW idle dairy digesters.

30 Energy Commission's *Investor Owned Utilities Database of Contracts for Renewable Generation*. Can be downloaded at: www.energy.ca.gov/portfolio/contracts_database.html. Also, the database shows that between 800 GWh to 1100 GWh expected to come on-line by 2014.

31 Energy Commission's *Publicly Owned Utilities Database of Contracts for Renewable Generation*. Can be downloaded at: www.energy.ca.gov/2008publications/CEC-300-2008-005/index.html

Efforts to Streamline Permitting

To streamline the permitting process for anaerobic digesters, CalRecycle and the Central Valley Regional Water Quality Control Board (Central Valley Water Board) developed program environmental impact reports (EIR) for anaerobic digestion facilities. The program EIRs are intended to reduce the cost and timeframe needed to permit new anaerobic digester projects in California.

The Central Valley Water Board, with partial funding provided by the Air Resources Board, has completed a program Dairy Digester EIR to evaluate the environmental effects of dairy manure digesters and codigesters within the Central Valley Region. The EIR is intended to assist developers comply with the California Environmental Quality Act (CEQA) requirements related to water discharge and/or conditional waivers issued by the Central Valley Water Board to owners and operators of such facilities.

The program EIR being developed by CalRecycle will provide information for future policy considerations related to anaerobic digester facilities and provide background information on anaerobic digester technologies, potential impacts, and mitigation measures. This information will assist state and local agencies in preparing site-specific environmental documentation that may be required for anaerobic digester facility applications and/or permits submitted to CalRecycle and other state and local regulatory agencies. CalRecycle plans to release the final EIR in the second quarter of 2011.

While there are many anaerobic digestion projects throughout California, there is only one commercial-scale anaerobic digester facility currently processing organics from municipal solid waste; however, developer interest is growing, and a number of facilities have either been proposed or are under development. CalRecycle anticipates that anaerobic digester facilities will be developed across the state to meet the increasing need to divert organic waste from landfills. CalRecycle has prepared a program EIR to assess the potential environmental effects that may result from the development of anaerobic digester facilities throughout California.³²

Digesters at dairies and other sites may require discretionary permits from state, county, local agencies, and special districts separate from any permits issued by Water Boards or CalRecycle. The program EIRs will be useful to developers in satisfying CEQA requirements associated with some of those permits.. The goal is to reduce the time required for environmental document preparation and review for digesters at dairies and central facilities throughout the Central Valley.³³

32 CalRecycle. *Notice of Preparation of a Draft Statewide Program Environmental Impact Report for Anaerobic Digester Facilities for the Treatment of Municipal Organic Solid Waste*. April 30, 2010.
<http://www.calrecycle.ca.gov/SWFacilities/Compostables/AnaerobicDig/NOP.pdf>

33 Central Valley Water Board. *Central Valley Dairy Digester and Codigester PEIR Notice of Preparation/Initial Study*. March 2010.

CHAPTER 3:

Objectives of the 2011 Bioenergy Action Plan

To achieve the goals of Executive Order S-06-06, some existing facilities will need to be retooled or expanded, and new facilities will need to be constructed. Table 3-1 summarizes the bioenergy goals for 2010 and 2020 and the potential additional bioenergy for existing, new, and integrated facilities. Even if the full potential is achieved for existing facilities and currently planned facilities, additional new facilities will likely be needed to achieve the 2020 goal.

As part of the *2011 Plan*, Energy Commission staff developed five objectives that build on the successes and lessons learned from the *2006 Plan*. These five objectives are:

1. Encourage increased bioenergy production at existing facilities.
2. Promote and expedite the construct new bioenergy facilities.
3. Promote and encourage the integration of bioenergy facilities.
4. Fund Research and Development.
5. Remove statutory hurdles and streamline the regulatory process.

The objectives are a path forward to achieving California's bioenergy goals. Development of the potential for new energy production in each objective will require overcoming many of the challenges facing the industry. In many cases, these challenges are complex. To see any meaningful progress towards achieving the state's goals, more than one challenge will need to be addressed.

Table 3-1: Path Toward Meeting California's Bioenergy Goals

E.O. S-06-06 Bioenergy Goals		Baseline	Existing Facilities	New Facilities[§]	Integrated Facilities	Total Potential plus Baseline
Biopower Goal (GWh)		2009 Generation (GWh)	Potential for Additional Generation (GWh/year)			GWh/yr
2010 [†]	7,200	6,400	3,000-3,600	1,400-1,800	>2,500	13,000-14,300
2020 [‡]	17,000-20,000	6,400	4,600-5,500	5,000	>2,500	18,500-19,400
Biofuels Goal (million gge)		2009 Production (million gge)	Potential for Additional Fuel Production (million gge /year)			million gge /yr
2010	135	48	217	20	Unknown	288
2020	Up to 820	48	217	92	Unknown	357

Source: Energy Commission

[†] Assumes renewable procurement of 20 percent for IOUs and individual targets for POUs.

[‡] Assumes renewable procurement of 33 percent for all load-serving entities regulated by the ARB's Renewable Electricity Standard.

[§] Projects identified by Energy Commission staff. The projects may be in various stages of development, including predevelopment, permitting, or under construction.

Objective 1: Encourage Increased Bioenergy Production at Existing Facilities

Restarting idle plants, repowering existing facilities, or switching from fossil-based feedstock to bio-based feedstocks can cost-effectively increase bioenergy production at existing facilities. Idled facilities are facilities that have been shut down, but the generation or fuel production equipment remains intact. Idle capacity represents stranded resources. In general, this capacity requires less capital to restart than siting, permitting, and constructing a new facility. For example, a recent Energy Commission study estimated that the cost of generation for a new solid fuel biomass facility is \$2,600 - \$3,000 per kilowatt (kW).³⁴ However, the study also estimated that the cost to retrofit an existing coal facility to cofire using up to 20 percent biomass is about \$500/kW.³⁵ The potential to increase biopower generation and biofuel production capacity at existing facilities is provided in Table 3-2.

Table 3-2: Potential at Existing Bioenergy Facilities

Resource	Potential per year
Restarting Idle Facilities	
Idle solid-fuel biomass facilities in California	1,100 GWh [†]
Idle dairy digesters in California	24 GWh [§]
Idle ethanol biofuel facilities in California	152 million gge
Idle biodiesel facilities in California	66 million gge
Expanding Role of Existing Bioenergy Facilities	
Increase generation at existing solid fuel biomass facilities	650 GWh [†]
Increase use of biogas flared at landfills [§]	700-1,350 GWh
Increase use of biogas flared at wastewater treatment plants [§]	400 GWh
Cofiring or fuel switching at existing fossil fuel facilities	100 to 2,000 GWh ^{††}
Repowering existing solid-fuel biomass facilities or adding boilers to increase usage of waste heat	No Data

Source: Energy Commission

[†] Energy Commission staff estimates based on best available data.

[‡] Energy Commission staff estimates assuming existing facilities could increase capacity factor to 85 percent.

[§] Energy Commission staff estimates assuming a 60 percent capacity factor.

^{††} Energy Commission staff estimates assuming 85 percent capacity factor. Minimum range based on cofiring with 5 percent biomass and maximum based on full fuel switch to biomass (100 percent biomass).

Loss of electricity generation or fuel production from existing bioenergy facilities will require development of additional new resources to achieve California's bioenergy goals. Due to the cost and challenges associated with the development of new facilities, the state must ensure

34 O'Donnell, Charles, Pete Baumstark, Valerie Nibler, Karin Corfee, and Kevin Sullivan (KEMA). 2009. *Renewable Energy Cost of Generation Update*, PIER Interim Project Report. California Energy Commission. CEC-500-2009-084. Page 16.

35 Ibid. Page 16.

existing facilities remain operational. Repowering³⁶ or retooling existing biomass facilities may be necessary to ensure that they remain operational, meet state, local, and national air quality standards, and use the most efficient or economic technologies. Repowering existing bioenergy facilities can also provide an opportunity for increasing production capacity.

Solid-fuel biomass facilities currently participating in the Energy Commission's Existing Renewable Facilities Program (ERFP) represent 600 MW of capacity.³⁷ In 2009, participating facilities generated 3,800 GWh, operating at 70 percent of capacity.³⁸ Generally, well-maintained solid-fuel biomass facilities can operate at 90 percent capacity averaged over a year (90 percent capacity factor), given sufficient affordable feedstock and an adequate price for energy. Conservatively, Energy Commission staff estimates that existing biomass facilities have the potential to increase generation by 650 GWh per year if they operate at 85 percent capacity, assuming the facilities can overcome feedstock and energy price challenges. Expanding and/or repowering existing biomass facilities are potential options for the industry, however, only two facilities have done so in the last ten years. Incentives that may encourage this include higher energy payments, lower feedstock costs, or lower tax burdens.

Arguably, one of the most attractive and easily developed renewable energy sources is fuel switching or converting California's in-state coal facilities to biomass. Converting California's in-state coal facilities to biomass are cost-effective because similar technologies can be used to convert coal and biomass to energy. For example, Millennium Energy estimated the cost to complete a retrofit of the 50 MW Mount Poso coal cogeneration facility to a renewable biomass facility would be \$1,000/kW. Once completed, the facility would operate as an Renewables Portfolio Standard (RPS) certified biomass facility.³⁹

For coal facilities that cannot fully convert to biomass due to insufficient feedstock availability or lack of investment funds for boiler modifications, biomass cofiring, where biomass and coal are combusted simultaneously, requires less biomass feedstock and minimal boiler modifications. Cofiring can displace 5 to 30 percent of the fossil fuel used by the coal facility.⁴⁰

36 Repowering means replacing a significant portion of the generating equipment at an existing facility. Further restrictions apply to facilities seeking status as a repowered facility in the Renewables Portfolio Standard including, but not limited to, replacement of all prime generating equipment and a capital investment of at least 80 percent of the value of the repowered facility. Please see the *Renewables Portfolio Standard Eligibility Guidebook* for more details.

37 This capacity includes on-site load. Many of these facilities service on-site load, such as lumber mill operations. Depending on the rules developed for the Renewables Portfolio Standard, on-site generation may be eligible for the RPS through the sale of tradable RECs.

38 Energy Commission's Existing Renewable Energy Program.

39 Michael Hawkins, Millennium Energy. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 101.

40 O'Donnell, Charles, Pete Baumstark, Valerie Nibler, Karin Corfee, and Kevin Sullivan (KEMA). 2009. *Renewable Energy Cost of Generation Update*, PIER Interim Project Report. California Energy Commission. CEC-500-2009-084. Page 16.

In 2009, KEMA estimated that the cost to cofire with biomass at a coal-fired facility would cost \$400-\$700/kW.⁴¹

Comparing cofiring or fuel switching to the cost to construct a new biomass facility (\$2,600 - \$3,000/kW), cofiring or fuel switching at existing facilities looks very attractive. The potential for cofiring in-state is 15 - 75 MW and up to 290 MW if the facilities undergo a full fuel switch to biomass. In-state coal cofiring and fuel switching represent a potential of 100 - 2,000 GWh/yr.

In 2008, California utilities imported approximately 52,000 GWh of coal-derived power. Although cofiring with biomass at out-of-state coal facilities is technically possible, current California policies do not support it for a variety of reasons. Restrictions in California's Emissions Performance Standards would likely preclude any facilities from securing long-term power purchase agreements (greater than five years) with California's load serving entities unless the plant's GHG emissions are less than a comparably sized natural gas combined cycle gas turbine.

In addition, restrictions in the Renewables Portfolio Standard do not allow generation from out-of-state facilities to count toward the state's renewable targets unless the facility is new or repowered. Policies to encourage fuel switching at coal plants need to be reviewed and explored further.

Of the seven biorefineries in California, four of the modern corn grain ethanol biorefineries are off-line due to adverse market conditions. As a result, California imports nearly all of the ethanol the state uses each year from large Midwest ethanol producers. Idle capacity represents 152 million gallons of gasoline equivalent (gge) per year.

Of California's 11 biodiesel plants, 6 facilities are idle due to biodiesel's inability to compete with petroleum-based diesel prices. Idle capacity represents 66 million gge per year.

Operators of public works projects and landfills must capture and destroy fugitive methane emissions. Due to difficulties obtaining air permits, meeting air quality standards in some California air districts, and the economics of power generation, much of this potential energy resource is flared. While power generation on-site may increase some air pollutants compared to flaring, cleaning and upgrading this gas to meet pipeline or transportation fuel standards would allow this resource to be utilized.

For example, Waste Management operates a landfill gas to liquid natural gas plant in California producing 13,000 gallons per day (about 20,000 gge per day), which they use to fuel their truck fleet.⁴² The U.S. EPA estimates that candidate⁴³ landfills have the potential to generate 720 GWh

41 Ibid. Page 16.

42 Chuck White, Waste Management Waste Management. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 146. Data conversion assumes 1.52 gge/gallon LNG.

43 U.S. EPA defines a candidate landfill as one that is accepting waste or has been closed for five years or less, has at least one million tons of waste, and does not have an operational or under-construction project; candidate landfills are also designated based on actual interest or planning. (U.S. EPA Landfill Methane Outreach Program.)

per year or produce 20 million gge, per year of liquid natural gas with an additional 900 GWh/year, or 30 million gge of liquid natural gas, from other potential LFG to energy sites.⁴⁴

Objective 2: Expedite Construction of New Bioenergy Facilities

Bioenergy facilities include both those that convert biomass to energy and those that produce biofuels either from organic wastes or from crops specifically grown for biofuel production. The number of bioenergy facilities needed to meet California's bioenergy goals will depend on the production from existing and colocated facilities. To meet these targets, project developers must site new facilities near sustainable fuel sources or a reliable feedstock transportation network. The *2011 Plan* identifies actions that state agencies and other stakeholders will take to reduce the length of time to obtain permits and increase the availability of sustainable feedstock. The goal is to expedite the construction of new bioenergy facilities. State agencies will continue to work with project developers to encourage sustainable growth of the bioenergy industry in California.

Biomass Resources

California has access to significant amounts of diverse biomass resources. The full extent to which California can sustainably, and economically, manage these resources for energy production is speculative. The uncertainty is due in part to lack of reliable data on the amount of biomass that is potentially available in the state every year and the amount that can be harvested or collected sustainably. Not all of the biomass produced in the state can or should be used for bioenergy production.⁴⁵

The biomass that is potentially available as a feedstock for energy production (technical potential) is the amount of biomass that can be harvested without adversely affecting soil fertility and tilth, or erosion control, and where the biomass is accessible when considering terrain limitations, environmental and ecosystem requirements, collection inefficiencies, and a number of other technical and social constraints. The amount of biomass that is technically available is therefore substantially less than the gross production of biomass. Furthermore, of the amount that is technically available, only a portion is economically recoverable. The amount of feedstock that is economically recoverable depends on site-specific constraints.⁴⁶

The California Biomass Collaborative estimates that the technical potential of biomass is 36 million bone dry tons per year (BDT/yr) in 2010, which, if used solely as a feedstock for electricity generation, could be used to generate 40,000 GWh/yr biopower. The collaborative also estimates that resource growth and improvements in conversion efficiencies could increase

44 U.S. EPA Landfill Methane Outreach Program. Data conversions assume: 300 scf per minute of LFG is available for utilization for every million tons of waste in place; Methane content of LFG is 50 percent; Methane heat content is 1,012 Btu/scf methane; Weighted average heat rate for LFG-fired engines, turbines, and boiler/steam turbines is 11,700 Btu/kWh; and capacity factor of 65 percent. (www.epa.gov/lmop/projects-candidates/interactive.html)

45 Williams, R.B. 2008. An Assessment of Biomass Resources in California, 2007. California Biomass Collaborative. CEC-500-2006-094-D.

46 Ibid.

the technical potential in 2020 to 40 million BDT/yr, enough biomass to generate 50,000 GWh.⁴⁷ In 2008, in-state biopower facilities generated 5,700 GWh. Therefore, the net technical potential for new biopower facilities is 34,300 GWh in 2010 and 44,300 GWh in 2020. The amount of biomass that is economically recoverable is significantly less.

Through 2020, the largest potential sources of biomass will be the biogenic portion of municipal solid waste, in-forest residue, animal manures, landfill gas, orchard and vineyard residues, and some field crop and residues. California's biomass resources are sufficient to supply a substantially larger amount of biopower than is presently generated as well as increasing in-state biofuels production.⁴⁸ Table 3-3 summarizes the technical potential by resource type assuming the total resource potential is used to either generate electricity or transportation fuels.

Table 3-3: Biomass Technical Potential

Feedstock Source	2010 (GWh)	2020 (GWh)	2010 (million gge)	2020 (million gge)
Agriculture	10,000	10,000	310	310
Forestry	18,000	21,000	560	650
Municipal Waste	10,000	13,000	310	400
Dedicated Crops	2,000	6,000	60	190
Feedstock used by Existing Facilities	5,700		180	
Net Technical Potential	34,300	44,300	1,060	1,370

Source: California Biomass Collaborative

Assumed conversion of 32.3 GWh/million gge

Note: Totals may not sum due to rounding

no data available on amount of in-state fuel used by California biofuel producers

Increased Biomass Demand From Biofuels

By 2022, the Energy Commission estimates that demand for ethanol could increase to more than 3 billion gallons per year, and biodiesel demand could increase to more than 200 million gallons per year.⁴⁹ In one LCFS scenario, ARB staff estimates that 18 cellulosic biorefineries, 6 corn-ethanol biorefineries, and 6 new biodiesel or renewable diesel refineries could be needed by 2020 to meet the increased demand for low-carbon biofuels.⁵⁰ Presumably, ethanol and biodiesel

⁴⁷ Ibid.

⁴⁸ Williams, R.B. 2008. An Assessment of Biomass Resources in California, 2007. California Biomass Collaborative. CEC-500-2006-094-D.

⁴⁹ Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF.

⁵⁰ California Air Resources Board. 2009. *Proposed Regulation to Implement the Low Carbon Fuel Standard: Initial Statement of Reasons*, March 5, 2009 cited in Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology*

will continue to be the primary biofuels, at least in the midterm (2-5 years). Others such as biomethane, renewable hydrocarbons, and renewable hydrogen may also play a role, but commercial development at sufficient scale seems to be many years away. Biomethane as a transportation fuel will be valuable for helping meet the necessary carbon reductions, as it can range from 80 to 87 percent GHG reduction below the gasoline baseline on a full-fuel-cycle basis.

Objective 3: Encourage Integration of Bioenergy Facilities

There are opportunities to encourage increased, sustainable bioenergy production by integrating biopower and biofuel production with community services (such as waste collection and disposal), environmental protection, the production of bioproducts, and using the residual from one process as the source of heat, fuel or feedstock for another. The goal of an integrated facility should be to extract maximum value or utility from the biomass feedstock. Currently, combined heat and power facilities are used around the country to provide heat for buildings or industrial processes, but future applications will likely include production of value-added products (biopolymers, fertilizers, and minerals), reducing feedstock competition and GHG emissions, and protecting water quality. Integrated bioenergy facilities can extract more energy and value from existing biomass resources, thereby increasing the facility's economic viability and value to society.

The *2011 Plan* encourages integrating bioenergy facilities with other processes by through actions aimed at identifying suitable feedstock locations, addressing concerns with using urban derived biomass from the waste stream, and making grant funding available for collocated facilities.

The following are some examples of integrated bioenergy facilities.

Colocating Bioenergy Facilities in Forest Urban Interface Areas That Have Fire Hazard Reduction Projects.

Communities in various locations along Sierra Nevada and Cascade mountain ranges require regular treatments to reduce wildfire risk by controlling the build-up of fuels (through biomass removal). The collected material must be disposed of through open-field burning, disposed of in a landfill, recycled at a compost facility, or converted to energy at a bioenergy facility. Transportation and disposal of biomass residues to locations more than 100 miles away can nearly double the cost of a fire hazard reduction project. Locating small bioenergy projects near forest urban interface areas can reduce treatment costs by producing energy and other useful byproducts, reduce GHG and particulate emissions from controlled burning or wildfires, and by supporting local employment and the development of energy supplies.

Codigesting Fats, Oil, and Grease (FOG), Food Processing Waste, and Other Waste at Wastewater Treatment Plants

Many municipal wastewater treatment plants use anaerobic digestion to reduce the volume of biosolids before disposal. The anaerobic digesters produce biogas, which is either flared or used

on-site as an energy source. The amount of biogas produced by existing facilities could fuel 125 MW of generation capacity.⁵¹

Due to the cost and feasibility of siting generation equipment at many of these facilities, much of the biogas produced is flared. A recent Energy Commission study estimated that, using existing infrastructure, codigesting FOG, food processing waste, and dairy waste⁵² at existing wastewater treatment plants could increase the biogas yield potential to 450 MW of capacity, representing 2,500 GWh per year.⁵³

Wastewater treatment facilities are ideal for accepting diverted food waste because the facilities are often located in urban areas, have experience operating anaerobic digesters, and have existing infrastructure in place to capture biogas.⁵⁴ In addition, large treatment facilities could use the electricity and heat onsite.

Additional bioenergy generation potential can be derived by diverting food processing industry wastewater currently discharged on agricultural lands to municipal wastewater sanitary districts. Although the land discharge practice is the least cost option in the Central Valley region, environmental impacts on groundwater quality have shown the need to find alternatives to land disposal.⁵⁵ The increased revenue from bioenergy generation could be used to cover the cost of trucking wastewater and solid residues from food processing factories to nearby wastewater districts; however, treatment plant discharge limits may affect what material the districts will accept.

Colocating Bioenergy Facilities With Landfills, Transfer/Processing Facilities, and Compost Facilities

The benefits of colocating bioenergy facilities with waste handling sites include reduced collection and transportation costs, reduced per capita disposal, and reduced GHG emissions. For example, integrating a digester with a compost facility creates the opportunity for compost operations to extract the energy content of their feedstock before composting. In this process, anaerobic digestion of organic waste produces methane, and then the digestate (material

51 Kulkarni, Pramod. 2009. *Combined Heat and Power Potential at the California Wastewater Treatment Plants*. California Energy Commission. CEC-200-2009-014-SF. Page 13.

52 There may be significant potential problems with using dairy manure in a WWTP. Most dairies are in rural areas that do not have nearby wastewater treatment plants that could accommodate the increased residual waste loading (the salts and nutrients that remain after digestion). Unless the dairy is near a large urban area, the cost to transport the manure may also be prohibitively expensive, and even large WWTPs may be unable to meet their discharge limits if they accept significant amounts of manure and process water.

53 Kulkarni, Pramod. 2009. *Combined Heat and Power Potential at the California Wastewater Treatment Plants*. California Energy Commission. CEC-200-2009-014-SF. Page 13. Generation estimate assumes 60 percent capacity factor.

54 U.S. EPA, Region 9. *The Benefits of Anaerobic Digestion of Food Waste At Wastewater Treatment Facilities*. Page 2. Can be downloaded at: www.epa.gov/region9/organics/ad/Why-Anaerobic-Digestion.pdf

55 Hilmar Supplemental Environmental Project. http://hgp-inc.net/HilmarSEP/HilmarSEP_ExSumm.html.

remaining after anaerobic digestion) can be used to produce a useable compost product.⁵⁶ Compost use provides several environmental benefits, including water use savings, reduced soil erosion, reduced synthetic fertilizer and pesticide use, and reduced greenhouse gas emissions.

Colocating Cellulosic-Ethanol Production Plants With Existing Biomass Combustion (or Other) Facilities

Integrating the processes of biofuel production facilities with existing biomass power generators would exploit synergistic relationships between the processes. For example, fine particles of wood are not suitable for combustion in a biomass boiler; however, this material can be used as a feedstock to produce ethanol. In addition, a by-product of the cellulosic ethanol production process is lignin, which is still carbon-rich and can be used as a feedstock for solid-fuel biomass facilities.

Colocating cellulosic-ethanol production plants with existing biomass combustion (or other) facilities allows these facilities to share the transportation and collection costs of the biomass feedstock, increase the conversion efficiency of biomass-to-energy conversion, and decrease the carbon intensity of the facilities.

Objective 4: Fund Research and Development

Next-generation biomass conversion technologies will build upon the successes of current technologies to improve economics and externalities (for example, lower air emissions and reduced fuel costs through increased efficiencies and increased feedstock diversification). Next-generation technologies include both thermochemical and biochemical conversion processes that can use a wide range of feedstock. Each technology faces unique challenges to commercialization that must be considered. Some of these technologies have the potential to reduce air emissions from small distributed generation projects and increase the range of feedstock types compatible with energy generation.

Through publicly funded research and development, California can achieve a diverse set of goals, including energy security and diversification, GHG mitigation, rural economic development, and reducing the overall environmental impact of the energy sector. The *2011 Plan* recommends that the legislature reauthorize the Public Interest Energy Research Program to continue funding research and development projects that bring new technologies to the market.

Objective 5: Remove Statutory Hurdles and Streamline the Regulatory Process

Two programs that benefit bioenergy in California will expire in 2012. These are the Energy Commission's Renewable Energy Program, which provides financial support for existing solid-biomass facilities and the Public Interest Energy Research (PIER) Program. The Energy Commission will seek reauthorization of these programs in 2011.

56 Chuck White, Waste Management. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 148.

In addition, some California state statutes contain restrictive language that limits the use of conversion technologies in the development of waste to energy projects. The *2006 Plan* recommended that these restrictions be removed:

“Amend existing law to revise existing technology definitions and establish new ones, where needed. In particular, review the definitions of gasification, transformation, fermentation, pyrolysis, and manufacturing. Such statutory clarification would enable the utilization of biomass residues through combustion or non-combustion technology.”

Technology prescriptions and definitions for gasification, transformation, fermentation, pyrolysis, and other conversion technologies in state statute inhibit the development of environmentally safe bioenergy resources. Air and water quality standards are established and enforced by state and federal agencies, and California has the strongest environmental and permitting standards in the country. Bioenergy production technologies that meet California’s environmental standards should be allowed by state statute.

Another area that may need regulatory reform is pipeline standards for landfill gas usage. Current California law effectively restricts the injection of in state landfill gas into the natural gas pipeline system. However, California utilities can purchase landfill gas from out of state to meet their RPS goals. This double standard should be addressed.

Improving consistency among regulations and increasing coordination among regulators and policy makers would encourage development of bioenergy facilities. Permitting assistance for project proponents of new and emerging technologies would facilitate the development of the biomass industry in California. The details of recommendations for legislation and regulatory changes will be presented in following chapters.

CHAPTER 4:

Challenges to Bioenergy Development

The challenges to bioenergy have been discussed for many years through workshops and forums held by the California Energy Commission, California Integrated Waste Management Board (now CalRecycle), the California Department of Food and Agriculture, the Department of Forestry and Fire Protection (CalFire), the Air Resources Board, State Water Resources Control Board, the California Biomass Collaborative, United States Environmental Protection Agency (U.S. EPA), industry groups and others. These forums have provided developers, stakeholders, and state and federal agencies an opportunity to identify challenges to increased bioenergy development in the state. The *2011 Bioenergy Action Plan* identifies a number of the challenges including:

- Siting, permitting, and state policy challenges.
 - The cost of meeting air quality standards for small projects.
 - The lack of policy and regulatory coordination among local and state agencies.
 - Stringent biogas quality standards and pipeline interconnection.
 - Proposed U.S. EPA Maximum Available Control Technology requirements.
 - U.S. EPA Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule.
- Sustainable feedstock sourcing and transportation issues.
 - The cost of biomass collection, processing, and transportation.
 - Harvesting biomass for energy sustainably.
- Economics and financing issues.
 - Contract prices for existing solid-fuel biomass facilities.
 - Competition between biofuels and fossil fuels.
 - Uncertainty in the biomass market on project financing.
 - Unrealized net social, economic, and environmental benefits.
- Research and development challenges related to next generation technologies, biomass feedstock sustainability, and feedstock production systems.
 - Biomass-to-biomethane conversion technologies.
 - Low-emission distributed generation technologies.
 - Biomass-to-biofuels conversion technologies.
 - Feedstock production systems.
- Statutory and regulatory issues.
 - Expiration of state programs that help fund existing biomass facilities and that fund public interest energy research.
 - Statutory and inaccurate definitions that impede some conversion technologies for energy production, result in non-optimal technology choice, and limit opportunities to develop energy from post-recycled municipal solid waste.
 - Stringent restrictions and penalties on the injection of landfill gas into the natural gas pipeline.

Siting, Permitting, and State Policy Challenges

Numerous utility rules and state and local regulations and policies apply to developers and operators of bioenergy facilities. Improving consistency among regulations and increasing coordination among regulators and policy makers could encourage development of bioenergy facilities. Permitting assistance for project proponents of new and emerging technologies could facilitate growth of the bioenergy industry in California.

New projects developers must have sufficient capital on hand to fund projects during the permitting and interconnection stages of development because permit approval and utility interconnection agreements cannot be assured at the onset of project development.⁵⁷ The permit process can take months or years and can be very expensive.⁵⁸ Lenders avoid risk associated with permitting or utility interconnection and will generally require that project developers obtain state and local permits and utility interconnection agreements in hand before agreeing to finance a new project.

Project developers have identified specific siting and permitting challenges that impede project development. These challenges include the high cost complying with air quality permitting requirements, cost-effectively meeting regional air quality standards with current technology, lack of regulatory and policy coordination, lack of uniform biogas quality standards, and the high cost to interconnect small biogas projects to the natural gas pipeline.

The Cost of Meeting Air Quality Standards for Small Projects

According to project developers, one obstacle to developing new biopower facilities in California is meeting local air quality permit requirements. Examples of such requirements are presented below.

Air districts that do not meet the national or state ambient air quality standards are under mandate to reduce those pollutants to preserve public health. There are also national emission standards for hazardous air pollutants that may apply to biomass facilities. ARB and local air districts urge project developers to contact the local air district before starting a project to understand which pollutants must be controlled to what levels so that the costs of complying with air regulations are well understood and factored into business decisions. (See Appendix B for background on California's air quality structure.)

Emissions of Ozone and Particulate Matter

Many air districts in California are designated nonattainment for ozone and particulate matter (PM). California law and the federal Clean Air Act require new or modified facilities with an emission increase to comply with the Best Available Control Technology (BACT) or the Lowest Achievable Emission Rate (LAER) standards, depending on a project's expected emissions. The local air quality permits are designed, in part, to implement these regulatory requirements. Therefore, new biomass facilities must install a combination of generation equipment and emissions control equipment to reduce emissions to meet the applicable emission requirements.

57 Fred Tornatore, TSS Consulting. June 3, 2011 Bioenergy Action Plan Workshop Transcript, pg 56.

58 Williams, R.B. 2008. An Assessment of Biomass Resources in California, 2007. California Biomass Collaborative. CEC-500-2006-094-D. Page 123.

In some cases, facilities that meet emissions limits may also be required to purchase emission reduction credits (ERCs).

Purchase of ERCs is particularly difficult in the South Coast Air Quality Management District (SCAQMD) due to the scarcity of credits for PM emissions. A typical 11 MW solid-fuel biomass facility emits about 100 pounds per day of PM 10-microns or less in size (PM-10).⁵⁹ As part of a new facility's air permit, the developer may be required to offset a portion of these emissions by purchasing ERCs. Although the cost of purchasing PM-10 ERCs has declined since its peak of approximately \$350,000 per pound per day in mid-2009,⁶⁰ this requirement could make new biomass projects in the SCAQMD economically challenging.

The air districts do provide offset exemptions under certain circumstances. For example, SCAQMD exempts facilities that emit less than 4 tons per year for each of the nonattainment air pollutants (such as volatile organic compounds, nitrogen oxides, sulfur oxides, and particulate matter) from the emission offset requirements. The exemption is particularly useful for smaller biomass facilities and facilities with enhanced emission controls.

Action Plan

- The Air Resources Board and the Energy Commission will work with the SCAQMD to implement AB 1318⁶¹, and recommend the most effective and efficient means of meeting electricity generation needs in the Los Angeles Basin while ensuring compliance with state and federal law.

Emissions From Engines That Use Biogas

Since the early 2000s, 18 dairy producers installed anaerobic digesters and engines to generate electricity using public funding from the Energy Commission. Most of these dairies were in the San Joaquin Valley. As of January 2009, those producers located in the San Joaquin Valley were required to demonstrate that their engines complied with new emissions standards adopted by the San Joaquin Valley Air District in 2005, in Rule 4702. Unfortunately, due to a number of economic issues, including the cost of meeting the new emission standards, only four dairy digesters were still operating in the San Joaquin Valley as of January 2009. Similar emission controls imposed by the South Coast Air Quality Management District resulted in the closure of a digester facility that utilized manure produced at several dairies in the Chino Basin.

Fuel Switching

Biopower facilities seeking to switch to or add a new fuel source must demonstrate to the local air district that the fuel switch will not cause the facility to increase emissions. Otherwise, the modified facility may be subject to the BACT or LAER standards and may even be required to

59 California Air Resources Board, facility details for Burney Mountain Power, available at: www.arb.ca.gov/app/emsinv/facinfo/facdet.php?co_=45&ab_=SV&facid_=42&dis_=SHA&dbyr=2007&dd=.

60 South Coast Air Quality Management District, September 24, 2009, "PM-10 Market Conditions and Offset Availability in SCAQMD," presentation by Mohsen Nazemi, available at: www.energy.ca.gov/2009_energypolicy/documents/2009-09-24_workshop/presentations/06_SCAQMD-Nazemi_Market_Conditions_and_Offset_Availability-092409_Final.pdf.

61 Assembly Bill 1318, V. Manuel Perez, Chapter 285, Statutes of 2009

provide emission offsets as discussed above. While agricultural residues have been used as a feedstock in biomass combustion technologies, many agricultural residues have not been tested in thermochemical conversion technologies, and, therefore, emissions data on these feedstock sources is not available. To show that the new fuel or new technology will meet the air emissions limits for the local air district, the project developer may be required to conduct emissions source testing, which could be substantial for small developers.

Action Plan

- ARB will provide manufacturers of bioenergy technologies with information about how to request verification of air-related claims about commonly used equipment. Specifically, the ARB will provide information about the air quality permitting process for local air districts; and ARB's Precertification and Distributed Generation Certification programs.

U.S. EPA MACT Proposed Ruling

The federal Clean Air Act requires the U.S. EPA to set national ambient air quality standards (NAAQS) for "criteria" pollutants considered harmful to public health and the environment. In an effort to meet a federal court deadline, the U.S. EPA proposed stringent new emissions, monitoring, and reporting requirements for broad categories of new and existing non-residential boilers, including those fired by biomass. The U.S. EPA's proposed rule for toxic and hazardous air pollution would require facilities use the Maximum Achievable Control Technology (MACT).⁶²

The proposed MACT rule would have restricted the allowable levels of carbon monoxide emissions and other hazardous air pollutants to those achieved by the top 12 percent of solid-fuel biomass facilities.⁶³ Although the U.S. EPA based the proposed MACT standards on the best operating facilities for each pollutant type, it is not likely that any of the existing facilities in the U.S. EPA's background study for the proposed rule would meet the proposed MACT standards for all pollutants at the same time. Due to the cost and other technical issues, existing biomass facilities may not be able to meet the emissions limits, which could result in the closure of existing solid-fuel biomass facilities.⁶⁴ However, new solid-fuel biomass may be able to meet this standard.⁶⁵

On August 19, 2010, Governor Schwarzenegger submitted comments to U.S. EPA Administrator Lisa Jackson from the ARB, CalRecycle, and the Energy Commission expressing concern over the potential impacts and unintended consequences of the proposed rules on California's solid-fuel biomass industry, the ability of the state to promote diversion from landfills, and to produce alternative fuels and energy. If the U.S. EPA adopted the proposed MACT rule as drafted, the Governor stated that it could affect electricity production from existing biomass plants, which represents about 2 percent of the state's total in-state generation.

62 www.epa.gov/ttn/atw/112j/112jaypg.html.

63 Ibid.

64 Patrick Holley, Covanta Energy. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Pages 67-69.

65 Ibid.

On December 7, 2010, the U.S. EPA announced that it had filed a motion in the federal District Court seeking an extension in the current court-ordered schedule. The U.S. EPA proposed using the additional time to revisit the rules based on a full assessment of public comments and additional data received since the rules were proposed. On January 21, 2011, the federal district court denied U.S. EPA's request for an extension.

The U.S. EPA issued the final rules on February 21, 2011. The new rules combine biomass and coal boilers into one solid-fuel category and eliminates the requirement that biomass boilers install scrubbers for certain pollutants, such as mercury and hydrogen chloride. The rule also establishes numeric emissions limits for mercury, dioxin, particulate matter, hydrogen chloride and carbon monoxide.⁶⁶

The U.S. EPA also announced that it will "reconsider" certain aspects of the boiler and commercial/industrial solid waste incinerator rules because some of the issues identified in the comments on the April 2010 proposed rules raised difficult technical issues that the agency believes would benefit from additional public involvement.⁶⁷

Action Plan

- The Working Group will continue to monitor this issue and provide comments to the U.S. EPA as needed.
- The Energy Commission recommends that the legislature consider offering incentives to existing biomass facilities to encourage conversion of aging generation equipment to cleaner, low emission technologies.

U.S. EPA Greenhouse Gas Tailoring Rule

On July 15, 2010, U.S. EPA solicited information on GHG emissions from bioenergy sources as they relate to the Prevention of Significant Deterioration (PSD) and Title V Greenhouse Gas Tailoring Rule (June 3, 2010), which established requirements for obtaining new air quality PSD permits for GHG emissions starting in 2011. U.S. EPA is now considering whether it will treat biogenic emissions as carbon neutral for the purposes of implementing the Tailoring Rule.

The Tailoring Rule sets GHG emissions thresholds that determine which facilities will need GHG emissions permits and will be subject to BACT requirements. If bioenergy emissions are not considered carbon neutral and are thus counted for the purposes of PSD, bioenergy facilities would be subject to new permitting requirements, permit fees, and as yet undeveloped (and thus unknown) control technology. This could deter or delay bioenergy development and impede the state's achievement of its RPS goals, and will also adversely affect California's achievement of its GHG reduction goals and climate adaptation objectives.

National GHG inventories and Intergovernmental Panel on Climate Change guidelines consider emissions from biogenic sources (for example, wood waste, agricultural waste, and manure) to be carbon neutral. Carbon emissions from biogenic sources are not counted against the energy sector because they are treated as part of a natural closed carbon loop in which carbon dioxide (CO₂) is sequestered by vegetation growth, released when plants die and decay or are

⁶⁶ www.epa.gov/airquality/combustion/actions.html#feb11

⁶⁷ www.epa.gov/airquality/combustion/actions.html#feb11

harvested, and captured again as vegetation grows back. Thus, bioenergy does not add new CO₂ to the atmosphere, whereas fossil fuels release carbon in permanent storage in the ground.

Using the residue from in-forest fuels reduction to produce energy has many benefits aside from helping to reduce GHG emissions. The controlled disposal of the residues that do not have higher and better uses at bioenergy facilities can reduce the air pollution otherwise emitted during open burning of timber harvest and mill waste, reduce the need for landfills, and reduce the threat of catastrophic wildfires through the controlled disposal of residues.

Furthermore, biomass-to-energy facilities can reduce wildfire suppression costs and offset the cost of in-forest fuels reduction projects. These projects can improve the health of forests, restore fire-resistant conditions by reducing fuels that have built up over nearly a century of fire suppression and help to reduce impacts from climate change-related increases in the number and severity of wildfire (for example, Westerling et. al., 2009, predict up to 100 percent increase in Northern California⁶⁸).

On September 13, 2010, Governor Schwarzenegger's office sent a letter to Administrator Lisa Jackson of the U.S. EPA in response to a Call for Information on approaches to accounting for GHG emissions from bioenergy facilities. The letter was supported by comments from the ARB, Cal Fire, and the Energy Commission. The letter conveyed California's position that "bioenergy can be a 'carbon-neutral,' sustainable energy source" and that "California is counting on the substantial use of bioenergy to meet our GHG reduction goals."

Action Plan

- The Working Group will continue to monitor this issue and provide comments to the U.S. EPA as needed.

Coordinated Policy Implementation

As noted in the 2006 *Roadmap for Development of Biomass in California*,⁶⁹ "most new biomass projects will require a land-use permit, conditional-use permit, a zoning or master-plan amendment, or some combination of these. These permits are discretionary and usually require approval by locally elected bodies such as county supervisors or city councils."⁷⁰ Greater coordination between state and local permitting agencies can reduce permitting time, particularly for technologies with the highest net environmental benefits. The current approach promotes inefficient use of potential energy resources and, in some cases, pollution shifting from one environmental medium to another,⁷¹ whereas, coordinating the review and

68 Westerling, A. L., B. P. Bryant, H. K. Preisler, T. P. Holmes, H. G. Hidalgo, T. Das, and S. R. Shrestha. 2009. *Climate Change, Growth, and California Wildfire*. August 2009. California Climate Change Center. CEC-500-2009-046-F

69 Jenkins, B. M., et. al. *A Preliminary Roadmap for the Development of Biomass in California*. December 2006. California Energy Commission. CEC-500-2006-095-D.

70 Williams, R.B. 2008. *An Assessment of Biomass Resources in California, 2007*. California Biomass Collaborative. CEC-500-2006-094-D. Page 123.

71 Alan Dusault, Sustainable Conservation. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 195.

permitting of a new project would allow state and local agencies to analyze the project's cumulative impact and alternatives together.

Historically, proposed bioenergy projects in California have encountered a lengthy permitting process and uncoordinated regulatory requirements. For example, stakeholders have raised the following issues:

- Unlike other states, California does not have a singular state agency responsible for regulatory oversight and coordination. Some believe that this type of agency could provide arbitration when regulations and policies conflict.⁷²
- The current regulatory structure may result in shifting pollution from one medium to another⁷³ and conflicting regulations.⁷⁴
- The current regulatory structure can inhibit development by small developers because obtaining needed permits can be expensive and time-consuming. Small bioenergy developers, unlike large developers, typically do not have the capital to finance the early stages of the project, and lenders typically will not finance a project until the developer obtains all necessary permits. In addition, the process may be daunting to inexperienced developers, discouraging innovation and small-scale generation.

Uncoordinated regulations can impede development of renewable energy resources without considering the greatest net environmental benefit. Simplifying and coordinating California's siting and permitting requirements can be done without lowering its environmental standards and to make it easier for businesses to "wade through the often difficult, complicated, duplicative bureaucracies that delay economic investment and job growth."⁷⁵ In addition, uncoordinated regulations can limit technology development or exclude otherwise acceptable feedstock sources.

For example, most landfills and wastewater treatment plants are required to collect and destroy fugitive methane emissions. Operators have the option to destroy the gas by flaring the gas or using the gas to generating electricity. Other potential disposal methods include collecting and upgrading the gas to biomethane for pipeline injection or use as a transportation fuel. Obtaining air permits to flare that gas is relatively easy due to provisions in the Health and Safety Code. However, operators choosing to use the gas to generate electricity on-site are often required to obtain two air permits, a permit to flare the gas and a permit to generate electricity.

72 Alan Dusault, Sustainable Conservation. *2011 Bioenergy Action Plan* stakeholder workshop written comments. June 11, 2010.

73 For example, restrictions on air pollutants may lead to developers choosing a technology that increases water pollution, or by eliminating a developer's ability to employ a technology that could improve water quality because it would increase emissions of air pollutants.

74 Alan Dusault, Sustainable Conservation. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 195.

75 Senate Pro Tem Darrell Steinberg, as quoted by the Sacramento Bee. blogs.sacbee.com/capitolalert/latest/2011/01/steinberg-wants-big-review-to.html#ixzz1EkAUIOZB

Restrictions in California statute⁷⁶ have led to gas utilities refusing to accept injection of biomethane from landfill gas into the California gas pipeline whereas other states, such as Texas, allow upgraded landfill gas injection into the natural gas pipeline.⁷⁷ The result is that landfill and wastewater treatment plant operators tend to flare the gas, though some landfills have begun using the resource to fuel landfill trucks and equipment.

Energy Commission staff estimates that landfills flare enough methane to generate 700-1,600 GWh per year.⁷⁸

Although state law defines municipal solid waste (MSW) as a renewable fuel for electricity production (even though MSW often contains fossil-derived energetic components such as plastics), the law⁷⁹ narrowly defines the environmental and operational parameters that solid waste conversion technologies must meet to be eligible for renewable energy credits through the RPS. To date, one combustion facility, specifically referenced in statute, is eligible for the RPS.⁸⁰

Statutory rules governing MSW facilities and the RPS treat biomass conversion similarly. Neither statute imposes the same restrictions as required by MSW conversion. However, the organic fraction of MSW is treated differently. RPS guidelines do not distinguish between the organic portion and the non-organic portion of the waste stream. Therefore, once organic waste enters the waste stream, it is considered MSW and must meet the statutory requirements for conversion to energy to be eligible for the RPS.

This requirement is not consistent with how CalRecycle defines solid waste and biomass.⁸¹ Because CalRecycle regulates facilities that handle solid waste and not the solid waste itself,

76 Because the gas may contain vinyl chloride at unacceptable levels and trigger penalties established by Assembly Bill 4037 (Hayden, Chapter 932, Statutes of 1988).

77 *SMUD to Purchase Green Gas From Texas*. SMUD press release. April 15, 2009.

78 U.S. EPA Landfill Methane Outreach Program. Data conversions assume: 300 Standard cubic feet per minute (scfm) of LFG is available for use for every million tons of waste in place; methane content of LFG is 50 percent; methane heat content is 1,012 British thermal units (BTU) per standard cubic feet (scf) of methane; Weighted average heat rate for LFG-fired engines, turbines, and boiler/steam turbines is 11,700 Btu/kWh; and capacity factor of 65 percent. (www.epa.gov/lmop/projects-candidates/interactive.html)

79 Public Resources Code Section 25741.

80 California Energy Commission, *2009 Integrated Energy Policy Report*, Final Commission Report, December 2009. CEC-100-2009-003-CMF. Pages 74-75.

81 PRC 40106. (a) "Biomass conversion" means the controlled combustion, when separated from other solid waste and used for producing electricity or heat, of the following materials:

- (1) Agricultural crop residues.
- (2) Bark, lawn, yard, and garden clippings.
- (3) Leaves, silvicultural residue, and tree and brush pruning.
- (4) Wood, wood chips, and wood waste.
- (5) Nonrecyclable pulp or nonrecyclable paper materials.

CalRecycle does not regulate MSW that has been processed into a product that meets the quality standards acceptable to the marketplace.

Opponents to the use of post-recycled MSW as a renewable energy source cite two key arguments: (1) the lack of third-party verified emissions data from a commercial scale MSW conversion facility in California, and (2) promoting the use of waste for energy may conflict with the state's recycling goals by creating a new demand for waste products.

CalRecycle estimates that organic material makes up more than 60 percent of MSW.

Action Plan

- The Energy Commission will develop a program to assist local governments streamline the permitting process for renewable energy projects.
- The Energy Commission and CalRecycle will together to resolve the difference between how each program defines organic wastes.
- The Working Group will develop a web-based permitting tool to help developers locate permitting links, guidance, and contacts to permitting agencies.
- The Energy Commission will evaluate bioenergy policies in other states and the European Union to identify notable policies and programs to advance biopower production.
- If funding is available, the Energy Commission will work with CalRecycle to analyze the potential environmental impacts of conversion technologies at a program level and develop a program Environmental Impact Report

Interconnection Challenges for Distributed Generation Technologies

New and existing biopower projects tend to be small, distributed energy projects less than 20 MW. The direct correlation of cost to distance of biomass transportation necessitates size constraints on these facilities. Stakeholders state that the interconnection process can pose challenges for biopower, and other distributed generation developers. Some biopower developers may choose not to develop projects due to complications of obtaining utility interconnection and uncertainty about the process, including the length of time to complete the interconnection process and the total cost of the process.

(b) "Biomass conversion" does not include the controlled combustion of recyclable pulp or recyclable paper materials, or materials that contain sewage sludge, industrial sludge, medical waste, hazardous waste, or either high-level or low-level radioactive waste.

(c) For purposes of this section, "nonrecyclable pulp or nonrecyclable paper materials" means either of the following, as determined by the board:

- (1) Paper products or fibrous materials that cannot be technically, feasibly, or legally recycled because of the manner in which the product or material has been manufactured, treated, coated, or constructed.
- (2) Paper products or fibrous materials that have become soiled or contaminated and as a result cannot be technically, feasibly, or legally recycled.

California's utilities use two different processes to interconnect generators to the distribution system; Rule 21 and the Wholesale Distribution Access Tariff (WDAT). Rule 21⁸² is a state process under the jurisdiction of the CPUC, while the WDAT is a federal process overseen by Federal Energy Regulatory Commission.

In practice, the interconnection process is dependent on the contract or tariff chosen. Once a developer chooses a tariff or contract mechanism (e.g. Net Energy Metering, Feed-in Tariff, Renewable Auction Mechanism, RPS Power Purchase Agreement) the appropriate interconnection process is pursued. The interconnection process includes obtaining permission for generation equipment interconnection to the utility grid as determined by each utility's Rule 21 tariff and WDAT, which is dependent on the above chosen contracting mechanism. In some cases, the interconnection review process may require utility interconnection studies and fees, that vary depending on the size of the generator, the unique characteristics of the generating technology, or the utility's distribution system characteristics in that local area.

While distributed generation projects can be developed quicker than large-scale renewable energy projects, increased interest over the past two years has overwhelmed the existing interconnection processes, leading to an interconnection application bottleneck.^{83 84} From 2008 to the present, there has been a dramatic increase of interconnection requests for the distribution system, increasing from 10 to over 200 in 2010.⁸⁵

Action Plan

- The Public Utilities Commission will review the Rule 21 interconnection processes and may convene stakeholders to discuss interconnection issues as needed.

Biogas Quality Standards and Pipeline Interconnection

Biogas is principally composed of methane and carbon dioxide. Methane can range from about 40 percent to as high 70 percent by volume of the raw biogas with carbon dioxide accounting for the remainder. Biogas also contains water vapor and often sulfur compounds and siloxanes.⁸⁶ Raw biogas must be stripped of carbon dioxide, moisture, and minor contaminants before it can be used as compressed renewable natural gas or injected into a utility gas pipeline. The upgraded biogas is commonly referred to as biomethane. For use in stationary engines or boilers, only minor contaminants like hydrogen sulfide and siloxanes are removed from the raw biogas; carbon dioxide can remain in the gas.

82 California standards for the interconnection of distributed energy devices to the electric grid are contained in Rule 21, part of each investor-owned utility's tariff. Rule 21 specifies standard interconnection, operating, and metering requirements for distributed energy generators.

83 CPUC's Q4 2010 report has additional data: <http://www.cpuc.ca.gov/NR/rdonlyres/CFD76016-3E28-44B0-8427-3FAB1AA27FF4/0/FourthQuarter2010RPSReporttotheLegislature.pdf>

84 Gregory Stangl, Phoenix Energy. *Staff Workshop 2011 Bioenergy Action Plan Transcript*, December 14, 2010, Page 45.

85 Judith Ilké, CPUC. *Staff Workshop 2011 Bioenergy Action Plan Transcript*, December 14, 2010, Page 49.

86 Rapport, J., R. Zhang, B. M. Jenkins, and R. B. Williams. 2008. *Current Anaerobic Digestion Technologies Used for Treatment of Municipal Organic Solid Waste. Contractor Report to the California Integrated Waste Management Board*. Available: <http://www.ciwmb.ca.gov/publications/default.asp?pubid=1275>.

A number of gas quality standards for pipeline injection are specified by the California utilities in their CPUC-approved tariff rules.⁸⁷ Some additional standards are specified in CPUC General Order 58-A.⁸⁸ However, not all of the gas quality standards that may be appropriate for biomethane have been specified in the utility rules or in General Order 58-A. This has created different approaches by utilities applying the existing standards for biomethane injected into the natural gas pipeline. For example, Southern California Gas Company has developed a biogas guidance document to complement its natural gas standards, whereas Pacific Gas and Electric (PG&E) has taken a project-by-project approach to applying its quality standards.⁸⁹ Southern California Gas said that its interconnection process was designed for large-scale natural gas production and that it is in the process of establishing an appropriate standard that fits biogas.⁹⁰

Currently, rules in the utilities' tariffs require project developers to pay for the costs of the interconnection.⁹¹ Project developers state that uniform and/or clearer gas quality standards would reduce the burden and cost faced by small developers to meet the standards.⁹² Although Southern California Gas allows biomethane from dairies to be transported in its pipelines, its Rule 30 dated April 2009 explicitly states that gas from landfills will not be accepted or transported.

Addressing the needs for clearer standards, the Gas Technology Institute (GTI) is preparing a guidance document for the U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration. The GTI proposal focuses on the analytical requirements of landfill and wastewater treatment renewable natural gas for safe and proper pipeline introduction into existing natural gas supplies. This effort will be similar to that prepared through the Guidance Document for Dairy Waste Conversion work.

Action Plan

- The Working Group will develop a subgroup to work with the gas utilities and other interested parties to address the barriers to injecting landfill gas into the natural gas pipeline.

87 Utility gas rules can be found at:

www.pge.com/tariffs/tm2/pdf/GAS_RULES_21.pdf
www.sdge.com/tm2/pdf/GAS_GAS-RULES_GRULE30.pdf
www.socalgas.com/regulatory/tariffs/tm2/pdf/30.pdf

88 *Standards for Gas Service in the State of California as Prescribed by the Public Utilities Commission of California General Order No. 58A*. California Public Utilities Commission, December 16, 1992. Available at: docs.cpuc.ca.gov/published/GENERAL_ORDER/54827.PDF

89 Kimberly Kemp, PG&E. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 135.

90 Gillian Wright, Director of Commercial and Industrial Services for Southern California Gas Company. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 153.

91 Utility gas rules can be found at:

www.pge.com/tariffs/tm2/pdf/GAS_RULES_21.pdf
www.sdge.com/tm2/pdf/GAS_GAS-RULES_GRULE39.pdf
www.socalgas.com/regulatory/tariffs/tm2/pdf/39.pdf

92 Paul Relis, CR&R. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 94.

- The Energy Commission through the Alternative Fuels Investment Plan, will provide funding for research to reduce the cost of biomethane gas clean up technologies.
- CPUC will work with the Energy Commission to examine whether additional gas quality standards should be adopted for biogas injected into utility natural gas pipelines.

Sustainable Feedstock Sourcing and Transportation

Sustainable and affordable supplies of biomass are critical to the long-term success of bioenergy. A common concern of investors seeking to build new or expanded capacity is the state of feedstock markets and the readiness of suppliers to enter into long-term feedstock contracts. In addition, fuel collection and transportation costs have remained an economic challenge to increasing use of agricultural, forestry, and dedicated crop biomass. The cost of urban-derived biomass can be offset through tipping fees received by a collection and processing facility, but may experience increased competition from soil amendment producers and ranchers, and in the long term, lead to higher prices to the end user.⁹³ Smaller scale, distributed, or portable conversion facilities may not require long-term fuel contracts, but they still require stable supplies with adequate storage.

In addition, the availability of sustainable biomass resources is an area where diverse state and federal rules, laws, and regulatory policies may operate at cross-purposes. Additional research and public outreach is needed by state agencies to define sustainability standards and continue to assess biomass feedstock potential throughout the state.

Biomass Collection and Transportation Issues

California's biomass is primarily urban derived biomass and residues from activities such as timber harvesting, lumber milling, in-forest fuels reduction, agriculture, dairy operations, food processing, and urban forestry. While some biomass such as urban derived biomass is available year-round, other biomass such as agriculture and food processing residues are seasonal. Most of the feedstock cost is incurred during the collection, transportation, and processing of material.

Collection of dispersed feedstock, such as forestry residues, is labor-intensive and expensive, making much of this material uneconomical to use for energy production. Seasonal fuels may also require storage facilities or plant downtime or incur additional expense when using alternative feedstocks in the offseason. These challenges make most bioenergy more expensive than the fossil fuels it replaces.⁹⁴ Collaboration among state and federal forestry agencies and the biomass industry is needed to increase sustainable feedstock collection and cost-sharing.

Although the resulting cost in terms of \$/million BTU for biomass is often higher than fossil fuel, using in-state biomass for renewable energy has additional benefits. For example, forest fuel reduction activities such as removal of dead vegetation, low branches, and small trees can improve forest health and reduce the risk of catastrophic wildfires, while producing biomass that can be used for energy production. Other benefits include reduced waste disposal

⁹³ Williams, R.B. 2008. An Assessment of Biomass Resources in California, 2007. California Biomass Collaborative. CEC-500-2006-094-D. Page 14.

⁹⁴ Ibid. Page 25.

problems, reduced GHG emissions, and fossil fuel displacement.⁹⁵ Depending on how the feedstock is harvested, in-state biomass may also reduce water and soil pollution.

Bioenergy project developers prefer fuel supplies located within 50 to 100 miles of the facility. Beyond this range, transportation costs are generally prohibitive. Although truck transport tends to be the most expensive form of transportation, it provides the greatest flexibility. In addition, truck transportation is often necessary to move biomass from collection points to the final destination or to rail or barge terminals. Generally, the costs of truck transport can range from \$0.12 to \$0.23 per ton-mile and are heavily dependent on the price of diesel.⁹⁶ Densification of woody material can reduce the cost of transporting material. However, at this time, densification technologies, including torrefaction⁹⁷ and pelletizing⁹⁸, add significantly to the feedstock cost. Additional work is needed to evaluate the feasibility of employing these technologies in California.

Transporting biomass over long distances via trains or in barges in locations near large waterways is typically less expensive on a per-mile or per-ton basis. However, additional handling and logistics often make this mode of transportation cost-prohibitive unless very long transport distances are involved.⁹⁹

The California Biomass Collaborative estimates that 36 million tons per year of biomass feedstock are technically available;¹⁰⁰ however, the economically recoverable amount is far lower. Increasing the amount of economically recoverable fuel by improving collection and transportation infrastructure and siting new bioenergy facilities optimal locations may improve the economies of scale for new bioenergy facilities.

Increasing the use of higher moisture organic biomass, such as food processing residues and food waste, as an energy feedstock will require a different supply chain model as compared than conventional solid-fuel biomass. Supply chain studies using Integrated Analysis Models can help calculate total cost of using different biomass materials.

95 Orta, Jason, Zhiqin Zhang, and et. al. 2010. *2009 Progress to Plan - Bioenergy Action Plan for California*. California Energy Commission. CEC-500-2010-007. Page 23.

96 KEMA 2009, *Coal to Biomass Fuel Switching - Potential Biomass Contribution to the California RPS*. Unpublished memo to the California Energy Commission. Conversion factor used: 0.907 U.S. tons per metric ton.

97 Torrefaction involves “roasting” woody biomass in a process that resembles roasting coffee beans, removing most the moisture from the wood.

98 Pelletizing consists of grinding woody material into sawdust then compressing it into pellets. Wood pellets are extremely dense. This allows them to be transported at low cost and combusted at a very high efficiency.

99 KEMA 2009, *Coal to Biomass Fuel Switching - Potential Biomass Contribution to the California RPS*. Unpublished memo to the California Energy Commission.

100 Williams, R.B. 2008. *An Assessment of Biomass Resources in California, 2007*. California Biomass Collaborative. CEC-500-2006-094-D.

Action Plan

- The Board of Forestry and Fire Protection is developing a Modified Timber Harvest Plan for Fuels Management. A modified timber harvest plan may increase access to affordable and readily available feedstock from wildfire hazard reduction and forest health activities.
- The Board of Forestry and Fire Protection and Cal Fire will provide training workshops for Cal Fire staff to implement the 2010 Strategic Fire Plan. Increased treatment of priority hazardous fuels which will improve community safety and forest health while generating woody biomass waste materials for energy production.
- The California Biomass Collaborative will update and renew an existing Web-based database to provide location, volume, quality, and seasonality of biodegradable waste suitable for codigestion at wastewater treatment plants. CalRecycle will work with the California Biomass Collaborative to integrate locations of post-consumer food waste into the Web-based database.
- Energy Commission will work with the California Biomass Collaborative to determine if it is feasible to expand the Collaborative's biomass resource assessment to identify locations of biomass material by region and net out existing biomass demand.

Feedstock Sustainability Concerns

Sustainable resource management can be defined as using a resource to meet current needs while preserving the ability of the resource to meet future needs. In addition, using resources to solve one problem is not desirable if that will create other problems.

For example, extensive biomass removal may negatively affect soil productivity, carbon and nutrient cycles, biological diversity, wildlife and endangered species habitat, and hydrology, resulting in downstream flooding, stream siltation, and degraded water quality and fisheries. Therefore, the harvest of "waste" biomass as a feedstock for the production of bioenergy must occur in a manner that protects the productivity and renewable nature of agricultural and forest ecosystems. Sustainable resource management also includes reforestation and the replacement of agricultural soil nutrients.

Not all agricultural crop or forest residues should be harvested. For example, some residues are needed to maintain soil fertility and tilth, or for erosion control. It is important to assess whether the economic and environmental costs of collecting and converting biomass to energy outweigh the benefits obtained from using a particular feedstock. This is best performed by comparing the life-cycle performance characteristics of various facilities, technologies, and feedstocks, and evaluating or estimating potential environmental effects.

The Energy Commission is required to "establish sustainability goals to ensure that alternative and renewable fuel and vehicle projects, on a full fuel-cycle assessment basis, will not adversely impact natural resources, especially state and federal lands."¹⁰¹ In response to this statutory directive, the Energy Commission developed three sustainability goals to identify and promote

101 Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF. Page 101.

transportation-related GHG reduction projects that are exemplary in sustainability and environmental performance.¹⁰² These goals are:

- 1) “[S]ubstantial reduction of life-cycle GHG emissions associated with California’s transportation system to help meet California’s 2020 and 2050 targets as defined in Health and Safety Code Section 38550 and the Governor’s Executive Order S-03-05.
- 2) . . . [P]rotect the environment, including all natural resources, from the effects of alternative and renewable fuel development and promote the superior environmental performance of alternative and renewable fuels, infrastructure, and vehicle technologies.
- 3) . . . [E]nhance market and public acceptance of sustainably produced alternative and renewable fuels by developing, promoting, and creating incentives for the production of such fuels in accordance with certified sustainable production practices and standards as established by government agencies, academic institutions, and nongovernmental organizations.”¹⁰³

Furthermore, sustainability assessments need to be conducted at the regional level as well as the project level to evaluate the effect of increased bioenergy crop production and integration with existing crop mix on food or animal feed production, agricultural water use, and wastewater discharges. In addition, studies are needed to measure water use and waste discharge for different types of biofuel production processes and bioenergy crops.¹⁰⁴

Stakeholder concerns that some feedstock may not be harvested sustainably led to the exclusion of forest biomass on national forests and other federal lands from the definition of renewable biomass in the federal Energy Independence and Security Act of 2007. This exclusion affects the availability of biomass feedstock for bioenergy in California. However, some members of Congress have called for an expansion of the definition to include woody biomass from federal forests because this could help to pay for needed fuels reduction projects and other ongoing forest management activities, which is still being debated.

California agencies and stakeholders have been participating in national, regional, and state discussions about sustainability guidelines and principles, which will affect the availability of bioenergy feedstocks. Through the Interagency Forest Work Group, the Climate Action Team has been coordinating discussions, technical workshops and field trips to examine questions about carbon and environmental sustainability of forest biomass for application to the AB 32¹⁰⁵ *Climate Change Scoping Plan*, the Alternative and Renewable Fuel and Vehicle Technology Program, and the Low-Carbon Fuel Standard.

¹⁰² Ibid. Page 101.

¹⁰³ Ibid. Page 101.

¹⁰⁴ Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF. Page 103.

¹⁰⁵ Assembly Bill 32, the Global Warming Solutions Act of 2006 (Núñez, Chapter 488, Statutes of 2006).

Action Plan

- The Energy Commission, and Cal Fire will continue to work with the Interagency Forestry Working Group to assess and define sustainability standards for biomass feedstock sourcing.
- The Working Group will support federal legislation that allows use of biomass harvested sustainability from federal lands in California as a renewable feedstock for bioenergy production.

Economics and Financing

Existing bioenergy facility operators continue to idle facilities or curtail generation, while few new facilities are being developed. Between 2002 and 2008, in-state biopower generation decreased from 7,140 GWh,¹⁰⁶ to 5,730 GWh,¹⁰⁷ a 25 percent reduction, and only 48 million gallons of gasoline equivalent (gge) of biofuel were produced in 2009, less than 20 percent of the state's installed capacity.

Many of the challenges of developing new projects or maintaining existing facilities are related to the economics of the project. Financing new bioenergy projects carries a high-risk premium to lending institutions, driven by return on investment and uncertainty surrounding feedstock costs and costs of meeting stringent regulatory standards.

Existing Solid-Fuel Biomass Facilities

From an economic standpoint, maintaining California's existing renewable energy facilities is one of the best ways to reduce the cost of achieving the state's renewable energy and climate-change goals. In 2009, more than 12 percent of the state's renewable power and 60 percent of California's biopower was generated by solid-fuel biomass facilities that started operating before 1996. Production from these facilities represents 680 MW and 3,800 GWh in 2009.¹⁰⁸

Since 1998, the California Energy Commission has offered financial support for existing solid-fuel biomass facilities through the Existing Renewable Facilities Program. This program will expire on January 1, 2012, without legislative reauthorization.

Most existing solid-fuel biomass facilities sell their generation under fixed-price contracts with an average annual energy price under \$66 per MWh, with contract prices varying from under \$45 per MWh to more than \$70/MWh.¹⁰⁹ Most of these facilities receive additional payments for

106 Pan, Adam and Ron Wetherall. 2003. *2002 Net System Power Calculation*. California Energy Commission. CEC-300-03-002

107 Nyberg, Michael, 2009. *2008 Net System Power Report*. California Energy Commission. CEC-200-2009-010.

108 Generation and capacity reported to the California Energy Commission's Existing Renewable Facilities Program in 2009.

109 California Energy Commission's Existing Renewable Facilities Program. Most of the biomass facilities participating in the program are contracted with PG&E at their fixed price for qualifying facilities, which can be downloaded at: www.pge.com/b2b/energysupply/qualifyingfacilities/prices/index.shtml.

capacity during summer peak periods ranging from \$30 per MWh to \$60 per MWh.¹¹⁰ Biomass feedstock purchases are a major part of the operating cost of a biomass plant and can range between a third and half of the facility's operating cost, depending on feedstock sources.¹¹¹ Because solid-fuel biomass feedstock costs range between \$20 and \$60 per MWh,¹¹² without additional revenue or other actions to realign the industry's fuel costs with their revenues, many of these facilities will be economically challenged.

Action Plan

- The Energy Commission will explore options to ensure that existing biomass facilities continue to operate after their existing utility power purchase contracts expire.
- The CPUC will work with the utilities and existing solid-fuel biomass facilities to ensure streamlined, quick, and fair processes through which they may renegotiate expiring contracts.

Obtaining Project Financing – Regulatory and Revenue Risks

New project developers must show that their projects have a sufficient rate of return on investment to obtain financing. In general, higher risk projects require developers to demonstrate a higher rate of return or provide more capital for the project. Risk factors include uncertainty over availability and price of biomass fuel supplies, technology, revenue, and governmental policy and regulatory uncertainty (that is, lack of clear signal regarding price of carbon credits and regulatory and permitting uncertainty).¹¹³

Increasing return-on-investment can improve the financial outlook of many projects. Government programs have attempted to accomplish this through direct monetary incentives for production, fuel subsidies, grants, loans, bonds, and tax credits. However, the use of government incentives creates uncertainty when public policies shift.

Generally, lenders will not carry the risk associated with permitting or utility interconnection and will require project developers to have state and local permits and utility interconnection agreements in hand before agreeing to finance the project. This requires the developer to have sufficient capital to permit and interconnect a new project.¹¹⁴

Risks associated with revenues include adequacy of the contract price to achieve a desired rate of return and price volatility. For projects pursuing feed-in tariff contracts, the price is

110 Many of the facilities receive capacity payments throughout the year. According to PG&E, these annual capacity payments average between \$24/MWh and \$30/MWh.
www.energy.ca.gov/bioenergy_action_plan/documents/2010-12-14_workshop/comments/PGandE_Comments_TN-59374.pdf

111 Phil Reese, California Biomass Energy Alliance. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 27.

112 California Energy Commission's Existing Renewable Facilities Program.

113 Ted Kniesche, Fulcrum Energy. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 187.

114 Ibid. Page 56.

statutorily set at the market price referent (MPR).¹¹⁵ The MPR represents the cost, over a 10-, 15-, 20-, or 25-year period, to own and operate a new combined cycle natural gas facility. The CPUC determines the MPR once utilities complete RPS solicitations.

The MPR serves two purposes, 1) a cost containment mechanism for power purchase agreements obtained through the RPS solicitation process, and 2) it is the price set for feed-in tariffs (FiT). The price of the MPR is not important for determining the economics of projects that bid into the RPS solicitation, however, it does offer challenges to small developers attempting to predict what the value of a future FiT will be.

FiT contract prices are fixed for the life of the contract (that is, do not change with a new MPR). Because the MPR is based on projections of future natural gas prices, which historically have been volatile, and changes after each RPS solicitation, project developers pursuing FiT contracts may not accurately project the future MPR. Failure to accurately predict how the MPR will evolve limits the ability of project developers to accurately determine their rate of return on a project.

Action Plan

- The Public Utilities Commission will continue to work on implementing and expanding feed-in tariffs for renewable energy projects through implementation of the SB 32 feed-in tariff and the Renewable Auction Mechanism for projects up to 20 MW.
- CalRecycle's Recycling Market Development Zones program¹¹⁶ may provide low interest loans to develop biofuels and renewable electricity using waste materials diverted from landfills.
- The Energy Commission's Public Interest Energy Research Renewable-Based Energy Secure Communities program will provide grants focusing on projects that capitalize on the synergies of colocating biopower or biofuel refineries with other biomass to energy projects, manufacturing facilities, or waste diversion, composting, transfer/processing, or disposal facilities.
- To promote restarting or retooling existing biofuel plants, and to promote development of new in-state production capacity, the Energy Commission will develop and implement funding programs through the *Alternative and Renewable Fuel and Vehicle Technology Program*.

Uncertainty in the Biomass Feedstock Market Can Effect Project Financing

Whether looking to restart or expand an existing facility or construct a new facility, bioenergy developers seeking financing must show that the project has long-term access to reliable and affordable feedstock sources. Without long-term feedstock commitments, securing financing is more difficult and less likely.

Lenders are looking for projects with "bankable" feedstock supplies, or sustainable fuel from creditworthy suppliers with long-term contracts.¹¹⁷ However, lenders may accept a supply

¹¹⁵ The MPR represents the levelized price at which the proxy natural gas combined cycle gas turbine (CCGT) revenues exactly equal the expected proxy CCGT costs on a net-present value basis.

¹¹⁶ For more information on CalRecycle's Recycling Market Development Zones program, please go to www.calrecycle.ca.gov/rmdz/.

assurance of less than 100 percent.¹¹⁸ Suppliers must be able to back up their agreements with a “sufficient” balance sheet showing historic fuel supply levels. Unfortunately, most fuel suppliers cannot back up their feedstock supply with a long balance sheet.¹¹⁹

Unrealized Net Social, Economical, and Environmental Benefits

The cost per energy unit of fuel for biomass is often higher than fossil fuel. This is primarily due to the cost to collect and process biomass before it can be used for energy production. However, using in-state biomass resources for renewable energy production has many social, economical, and environmental benefits such as reducing waste disposal problems and potential wildfire risks, avoids open-field burning, and reduces dependency on fossil fuels. These benefits help protect the environment and public health by reducing air, water, and soil pollution.

In the power sector, these regional environmental benefits do not directly affect most utility ratepayers, and therefore are not used to justify paying biomass energy producers more for the electricity they produce, even though these environmental benefits have qualitative value. Nonetheless, the production of electricity from biomass provides reliable power when the wind does not blow and the sun does not shine, which is a significant benefit to utility ratepayers.

Action Plan

- The Energy Commission will fund an outreach campaign to educate utility ratepayers of the many benefits of using biomass residues from agriculture, forests, and urban-derived sources.

Funding for Research and Development

Many existing and emerging challenges to bioenergy will require additional research and development. Research is needed to advance the next generation of bioenergy technologies, to develop economical air pollution control equipment for small-scale generators, to improve performance of small- and large-scale biopower systems, to develop biomass feedstock sustainability standards, and to measure the carbon benefits of different biomass feedstock used for energy production.

Many of the environmental challenges associated with current bioenergy technologies may be reduced or resolved through the development and commercialization of next generation technologies. These technologies have strong potential to assist California in meeting and exceeding many environmental and energy infrastructure goals. To support this achievement, significant investment from the private and public sectors is needed.

The goal of research and development is to improve performance and advance technologies so that they can be commercialized. While many technologies are being developed to address current challenges, facilities will still require access to sustainable feedstock.

117 Kevin Best, Real Energy. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 136.

118 Michael Theroux, JDMT Inc. http://www.energy.ca.gov/bioenergy_action_plan/documents/2010-12-14_workshop/comments/JDMT_Comments_TN-59368.pdf

119 Stephen Hawkins, Millennium Energy. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 104.

Action Plan

- The Energy Commission's Public Interest Energy Research Renewable-Based Energy Secure Communities program will make grants available to projects that capitalize on the synergies of colocating biopower or biofuel refineries with other biomass to energy projects, manufacturing facilities, or waste diversion, composting, transfer/processing, or disposal facilities.

Biomass-to-Biomethane Conversion Technologies

Biomethane can be produced by upgrading biogas from digesters and landfills. Converting biomass and biogas to pipeline quality biomethane provides the opportunity for biogas injection into the natural gas pipeline, or for compressing or liquefying the gas for use as a transportation fuel. Biomethane offers an effective way to increase renewable energy usage and displace natural gas. It is also possible to make a synthetic natural gas through thermochemical conversion of biomass (such as gasification) followed by gas reforming and methane synthesis, however, these technologies are in the developmental stage.¹²⁰

While anaerobic digestion is commercially available, it is generally limited to high moisture (non-woody) feedstocks such as food processing and dairy residues and certain biodegradable components of MSW. However, thermochemical processes such as gasification and pyrolysis are well-suited to convert dry, lignin-rich biomass such as forest residues, straw and orchard prunings, and major portions of the MSW stream. In the United States, thermochemical conversion technologies have been under development for many years but are not yet widely commercialized.

Challenges specific to thermochemical conversion technologies include high capital cost, the need for demonstration facilities, potential emissions, cost and reliability of downstream gas treatment and catalyst systems, and incorrect technology definitions in statute (discussed in the next section).

Action Plan

- The Energy Commission will provide funding for research to reduce the cost of biomethane gas clean up to meet gas quality standards for use as a transportation fuel or injection into the natural gas pipeline.
- The CPUC will evaluate the entire Public Interest Natural Gas Research and Development program to determine if the program should be modified.

Low-Emission Distributed Generation Technologies

Distributed generation technologies are typically sized less than one megawatt and provide on-site combined heat and power (CHP) needs. On-site generation of electricity has many potential benefits including lower fuel costs, limiting transmission congestion, avoiding the need to build new long distance transmission, energy storage, and demand response capability. Dairies, orchards, and food processing facilities are well suited for placement of small-scale generators that use process residues as a fuel source. However, many of these projects cannot economically meet air quality standards using internal combustion engines without expensive emission

120 *Advanced Technology to Meet California's Climate Goals: Opportunities, Barriers & Policy Solutions*. ETAAC Advanced Technology Sub-Group. December 14, 2009. Pages 4-11.

control equipment. Expanded incentive funding is needed to help offset the cost of alternative low-emission technologies such as (but not limited to) fuel cells, microturbines, and Stirling engines.

Fuel Cells

Fuel cells are one of the easiest distributed generation technologies to site, owing to their low emissions, high efficiencies, quiet operation, and modular design. High temperature fuel cells are also suited for certain CHP applications. Price remains one of the greatest challenges to wide scale adoption of fuel cells, with units costing between \$3,000 and \$5,000 / kW. Ongoing research and development continues to increase fuel flexibility, improve reliability, increase stack life, improve fuel reformer design, reduce size and system complexity, and develop low-cost material alternatives.¹²¹

Microturbines

Extensive microturbine research and demonstration projects are underway. In recent years, research has focused on using microturbines in CHP applications, focusing on improving microturbine efficiencies and fuel flexibility. Microturbine manufacturers have promised cost reduction with higher rates of production and sales, but to date, significant cost reductions have not materialized. Further, opportunities exist for improving microturbine efficiency by pairing microturbines with fuel cells.¹²²

Stirling Engines

Another emerging distributed generation technology is the Stirling engine, which is a type of external combustion engine. These engines can achieve lower emissions than reciprocating internal combustion engines. Stirling technology has not undergone a robust research and development phase, which contributes to its lack of proven operation and durability. Further, these engines are manufactured in very low quantities, resulting in a high and variable capital cost – ranging from \$2,000 to \$50,000 /kW. More research is needed to focus on creating inexpensive, reliable, and modular systems.¹²³

Biomass to Biofuels Conversion Technologies

Liquid fuels will continue to be needed to meet California's transportation needs. Due to the Federal Renewable Fuel Standard and California's Low-Carbon Fuel Standard (LCFS), renewable and low-carbon liquid biofuels will play an increasing role in meeting this need. These regulations will require the continued use of current biofuels technologies (sugar, starch

121 Contreras, Jose Luis, David Walls, Erin Palermo, David Feliciano (Navigant Consulting, Inc.). *Advanced Generation Roadmap Background Paper*, 2009. California Energy Commission, PIER Program. CEC-500-2009-086. Page 24.

122 Contreras, Jose Luis, David Walls, Erin Palermo, David Feliciano (Navigant Consulting, Inc.). *Advanced Generation Roadmap Background Paper*, 2009. California Energy Commission, PIER Program. CEC-500-2009-086. Page 47.

123 Ibid. Page 44.

fermentation, and vegetable oil transesterification¹²⁴) and increased use of cellulosic and other advanced biofuels.

A variety of advanced biofuels technologies are being pursued, including both biochemical and thermochemical processes (and sometimes integrating platforms), to produce biomethanol, ethanol, biobutanol, biodimethyl ether, mixed alcohols, biocrude, and “renewable gasoline and diesel,” which can be used in petroleum fuel production and distribution systems and existing vehicles without modification. This biofuel portfolio is the foundation for increasing the use of low-carbon renewable and alternative fuels by the 2020 to 2022 time frame.¹²⁵

Funding from the petroleum industry may provide valuable support for next generation conversion technologies. For example, British Petroleum has partnered with the University of California, Berkeley, Lawrence Berkeley National Laboratory, and the University of Illinois at Urbana-Champaign, to create the Energy Biosciences Institute. The institute will focus its research on biotechnology to produce biofuels, including corn, field waste, switchgrass and algae.¹²⁶

Cellulosic Ethanol Production

At the federal level, the U.S. Department of Energy (DOE), through the national laboratories and a number of universities, is promoting the development of cellulosic ethanol. This development is occurring through broad research and development support for developing more efficient enzymes and ethanol-fermenting organisms, conducting studies to improve technical processes, and cofunding initial demonstration facilities.¹²⁷ These efforts are aimed at reducing the cost of processing cellulosic ethanol while ensuring the validity of the technology.

The availability of a significant market is also crucial for cellulosic ethanol to become commercialized in California. For a robust cellulosic ethanol market to develop, government policies promoting price and market stability are needed. Competition with markets such as the highly subsidized and mature Midwest starch-ethanol industry disadvantages the relatively unsubsidized cellulosic ethanol industry.¹²⁸

Action Plan

- The Energy Commission will allocate funding through fiscal year 2011 to support feasibility studies for low-carbon cellulosic ethanol feedstock, including feasibility studies of modifications to existing plants.

124 The main reaction for converting oil to biodiesel is called transesterification. The transesterification process reacts an alcohol with the triglyceride oils contained in vegetable oils, animal fats, or recycled greases, forming fatty acid alkyl esters (biodiesel) and glycerin.

125 Baroody, Leslie, Charles Smith, Michael A. Smith, Charles Mizutani. 2010. *2010-2011 Investment Plan for the Alternative and Renewable Fuel and Vehicle Technology Program Commission Report*. California Energy Commission, Fuels and Transportation Division. Publication Number: CEC-600-2010-001-CMF. Page 55.

126 berkeley.edu/news/media/releases/2007/02/01_ebi.shtml

127 www1.eere.energy.gov/biomass/pdfs/37092.pdf. Page 1

128 www.library.ca.gov/crb/05/10/05-010.pdf. Page 18.

- The Energy Commission will fund research to improve conversion efficiencies of cellulosic biofuels derived from straw, corn stover, timber processing residues, and the organic fraction of MSW.

Algae-Based Biofuels

Today, algae-based production of biofuels is not economical.¹²⁹ Commercialization of this technology will require significant research and development to advance a range of technical constraints including strain/biological research, process improvements, production scale, and economic analysis. To advance this research and development, the DOE has provided grants to a number of research institutions including \$24 million to UC San Diego,¹³⁰ and \$9 million to UC Irvine.¹³¹

Statutory and Regulatory Issues

Financial Incentives for Existing Solid-Fuel Biomass Expire

The biomass industry receives financial assistance from California's Renewable Energy Program. Under this program, production incentives are offered to existing solid-fuel biomass and solar thermal facilities that began commercial operation before September 26, 1996, when market prices are below a specific target price. The authorization for the collection and expenditure of the funding for the Renewable Energy Program – California's public goods charge – is scheduled to end January 1, 2012.¹³² While the Energy Commission has deemed other existing renewable technologies competitive, existing solid-fuel biomass facilities continue to struggle in the marketplace. Many biomass facility operators contend that they cannot operate at their current levels without financial assistance.

According to industry representatives, existing biomass cannot compete effectively with other renewables because, unlike other renewables, biomass facilities must procure their fuel and transport it to the facility. Fuel procurement and transportation costs average \$20 to \$60 per MWh. In addition, wind and solar receive higher federal tax incentives, per kWh generated, than biomass technologies. The financial challenge facing these plants is evidenced by two more biomass facilities closing in 2009.

Action Plan

- The Energy Commission will seek reauthorization of the Renewable Energy Program, including funding mechanisms to support the state's existing solid fuel biomass facilities. Funding mechanisms for the legislature to consider include current incentives, incentives for improving efficiency or repowering, and incentives for eligible feedstock purchases.

129 www1.eere.energy.gov/biomass/pdfs/algabiofuels.pdf. Page 2.

130 apps1.eere.energy.gov/news/progress_alerts.cfm/pa_id=359.

131 www.universityofcalifornia.edu/news/article/23631.

132 Section 399.8 (c) (1) of the Public Utilities Code states, "The commission (California Public Utilities Commission) shall require each electrical corporation to identify a separate rate component to collect revenues to fund energy efficiency, renewable energy, and research, development and demonstration programs authorized pursuant to this section beginning January 1, 2002, and ending January 1, 2012."

Public Interest Energy Research Expires

Since 1998, the Energy Commission's Public Interest Energy Research Program (PIER) has funded 41 bioenergy research and development projects and studies, and additional research and development initiatives are called for in the *2011 Plan*. Funding for this program is also tied to the collection of public goods charge funds, which expires in 2012. The Energy Commission will seek reauthorization of the PIER Program in 2011.

Action Plan

- The Energy Commission will seek re-authorization of the PIER Program.

Energy From Urban Derived Biomass and Post Recycled Municipal Solid Waste

Since 2006, the Bioenergy Interagency Working Group has advocated the need to amend existing law to existing technology definitions and establish new ones, where needed. In particular, the definitions of gasification, transformation, fermentation, pyrolysis, and manufacturing need review. In addition, removal of technology performance standards currently in state statute would increase the use of biomass residues from the waste stream for electricity production using non-combustion thermochemical technologies.¹³³

There have been a number of legislative proposals to change the laws that are of concern; the most recent proposal was AB 222 of the 2009-10 legislative session.¹³⁴ Among other things, this bill sought to repeal statutory restrictions on conversion technologies using post recycled MSW feedstocks, and required MSW thermochemical conversion technologies meet the same public health standards for similar energy production projects. Opponents to the use of MSW as a feedstock for electricity production cite concerns over toxic air pollutants, reductions in recycling and composting programs, and the possibility of creating a "need for waste." Proponents state that there are proven technologies that can meet all of California's air quality standards and do not interfere with recycling goals.

The Energy Commission, ARB, and CalRecycle supported passage of the bill with the statement that it would allow "the introduction of a range of new technologies for production of biofuels and renewable energy from organic wastes that meets California's environmental standards. The legislation did not pass the state Senate.

Assembly Bill 2770,¹³⁵ chaptered in 2002, required the California Integrated Waste Management Board (now CalRecycle) to report on new and emerging conversion technologies and their impacts on recycling and other diversion activities.¹³⁶ One of the findings of the report was that "there is a projected net positive impact on glass, metal, and plastic recycling under the "base

133 Bioenergy Interagency Working Group, *Bioenergy Action Plan for California*, July 2006, CEC-600-2006-01. Page 9.

134 Assembly Bill 222, Adams and Ma. Bill significantly amended to remove energy related content. The final bill was subsequently chaptered as a childcare bill as Assembly Bill 222, Adams, Chapter 431, Statutes of 2010.

135 Assembly Bill 2770, Mathews, Chapter 740, Statutes of 2002.

136 *New and Emerging Conversion Technologies Report to the Legislature*. 2007. California Integrated Waste Management Board. Page 6.

case” conversion technology scenarios in life cycle/market impact study.”¹³⁷ That finding supports the desired changes in existing laws.

Action Plan

- The Energy Commission will work with CalRecycle on a series of actions to increase the use of urban-derived biomass from the municipal solid waste stream.

Pipeline Injection of Landfill Gas

Injecting biomethane into the pipeline allows the use of this resource without adversely affecting air quality districts. However, pipeline injection of biomethane from landfills is currently prohibited even if the gas is treated to meet health and safety standards.¹³⁸ The regulatory hurdles relating to landfill gas injection were imposed by Assembly Bill 4037 (Hayden, Chapter 932, Statutes of 1988),¹³⁹ associated CPUC regulations, and utility tariffs. The statute effectively precludes landfill gas from being introduced into the pipeline from in-state sources. However, PG&E has accepted natural gas delivered from interstate pipelines that may include landfill gas supplied from out-of-state sources. Sacramento Municipal Utility District recently published a press release stating that it has a 15-year contract to purchase landfill gas produced and injected into the natural gas pipeline in Texas.¹⁴⁰ Although it is not likely that the landfill gas molecules will make it to California, other states do allow landfill gas to be injected into utility pipelines.

In many cases, alternatives to pipeline injection (such as on-site power generation, liquefaction, and compression to a transportation fuel) are not feasible. Challenges to these alternatives include the cost of pollution control equipment or low-emission distributed generators and the cost of gas clean-up technologies. Currently, landfill gas that is not collected for energy production must be flared. Some estimate that this accounts for as much as 50 percent of the total amount of methane captured at landfills across the state.¹⁴¹ Energy Commission staff estimate that candidate and potential¹⁴² landfills could generate up to 1,500 GWh/year if utilized in an efficient combined cycle gas turbine.¹⁴³

137 *New and Emerging Conversion Technologies Report to the Legislature*. 2007. California Integrated Waste Management Board. Page 74.

138 Chuck White, Waste Management. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 147. Additionally, gas quality tariff rules of PG&E, SDG&E and SoCalGas explicitly state that they do not accept landfill gas.

139 The statute added Section 25421(a) to the California Health and Safety Code, which states that “no gas producer shall knowingly sell, supply, or transport landfill gas to a gas corporation, and no gas corporation shall knowingly purchase landfill gas, if that gas contains vinyl chloride in a concentration that exceeds the operative no significant risk level set forth in Article 7 (commencing with Section 12701) of Chapter 3 of Division 2 of Title 22 of the California Code of Regulations.”

140 *SMUD to Purchase Green Gas from Texas*. SMUD press release.
<http://www.smud.org/en/news/Documents/09archive/texas-gas-4-15-09.pdf>

141 Chuck White, Waste Management. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010. Page 166.

142 The U.S. EPA’s Landfill Methane Outreach Program defines a candidate landfill as one that is accepting waste or has been closed for five years or less, has at least one million tons of waste, and does

AB 2562, introduced in 2010, would have limited the restriction in AB 4037 to apply only to hazardous waste landfills. Project developers contend that non-hazardous waste landfills can meet the safety standards for vinyl chloride, and therefore should not be subject to the testing requirements imposed by the law. Opponents contend that allowing pipeline injection of landfill gas could impact public health and adversely affect the integrity of the pipeline over time.

Action Plan

- The Energy Commission, CalRecycle, and CPUC will work with California gas utilities and other stakeholders through a public process to address barriers to introducing landfill gas into the California natural gas pipeline.

not have an operational or under-construction project; candidate landfills are also designated based on actual interest or planning.

143 Assumes 300 scfm of LFG is available for utilization for every million tons of WIP. Methane content of LFG is 50 percent. Methane heat content is 1,012 Btu/scf methane. Weighted average heat rate for LFG-fired engines, turbines, and boiler/steam turbines is 11,700 Btu/kWh. Capacity Factor of 60 percent. (www.epa.gov/lmop/projects-candidates/interactive.html)

CHAPTER 5:

A Bioenergy Action Plan for California

As discussed in Chapter 4, there are a large number of challenges facing bioenergy development in the state. For the *2011 Plan*, the Bioenergy Interagency Working Group (Working Group) built on the *2006 Plan* and identified actions that state agencies could take by December 31, 2012 as the next step, with the goal of a meaningful increase in bioenergy development. Chapter 5 describes the actions developed by the Working Group to address the most significant challenges to bioenergy development and achieve the *2011 Plan's* objectives.

Due to the complexity and volume of challenges facing the industry and the amount of resources available to state agencies, not all of the challenges were addressed by the *2011 Plan*. Additional state action may be necessary as resources become available. The Energy Commission will develop and recommend additional actions for the Working Group to consider as resources become available through *2011 Integrated Energy Policy Report*.

1. Actions Addressing Siting, Permitting, and Regulation

1.1. Renewable Planning and Permitting Program

Planning and permitting renewable energy systems can be challenging for both local planning officials and developers, but expanding renewable energy development is critical to protect California's environment and to support clean energy job growth. As renewable energy development increases, the workload for cities, counties and local jurisdictions will also increase. Some jurisdictions are ill-equipped to permit and site renewable energy projects, due to not having a regulatory framework in place for reviewing renewable energy development requests or the resources to establish such a framework.

- The Energy Commission will develop the Renewable Planning and Permitting Program to provide local governments with assistance from state agencies that have renewable energy and transmission planning and permitting experience and expertise. During the first phase of this program, the Energy Commission will issue grants targeted at assisting eligible California cities, counties and local jurisdictions streamline their permitting processes.

Lead Agency: Energy Commission.

Desired Outcome: A consistent, transparent, and efficient local government permitting process.

Related Plan Objective: Construct new bioenergy facilities.

Completion Date: September 30, 2011.

1.2. Web-Based Portal for Permitting Guidance and Information

Coordination among state and local permitting agencies can streamline the permitting timeframe and reduce developer costs. New biomass projects must acquire various local and state permits, which are critical to obtain project financing. In general, lenders will not consider financing a new project in California until the project has obtained all necessary permits because of the uncertainty and cost of the permitting process. In addition, finding permit information can be a daunting task for both large- and small-scale developers.

- To assist new project developers with guidance to obtain permits, the Working Group will form a subcommittee to develop a comprehensive Web-based portal for permitting guidance, links, and contacts to permitting agencies.

Lead Agency: TBD.

Desired Outcome: Improve developer access to permitting guidance and contact information.

Related Plan Objective: Construct new bioenergy facilities.

Completion Date: September 30, 2011.

1.3. Address Interconnection Challenges for Distributed Generation Projects

- The California Public Utilities Commission (CPUC) will work with the Energy Commission to review the Rule 21 tariff interconnection processes. The CPUC will handle Rule 21 issues in Rulemaking (R) 10-05-004. There may be a need to convene stakeholders to discuss the specific interconnection issues that affect bioenergy projects.

Lead Agency: CPUC.

Desired Outcome: Streamline interconnection processes for developers of bioenergy distributed generation projects.

Related Plan Objective: Construct new bioenergy facilities.

Completion Date: December 31, 2012.

1.4. Air-Related Equipment Certification Programs

- ARB will provide manufacturers of bioenergy technologies with information about how to request verification of air-related claims about commonly used equipment. Specifically, the ARB will provide information about the air quality permitting process for local air districts; and ARB's Precertification and Distributed Generation Certification programs.

Lead Agency: ARB.

Desired Outcome: A process by which developers can seek verification of air-related claims about generation equipment.

Related Plan Objective: Construct new bioenergy facilities.

Completion Date: Ongoing through June 30, 2012.

1.5. AB 1318 – Wildfire Emissions Offset Credits for PM

- The ARB will work with the Energy Commission, Cal Fire, U.S. Forest Service, and local air pollution control districts to evaluate the regulatory feasibility and economic viability of forest health and hazardous fuels reductions programs potential source of PM ERCs in the SCAQMD and other non-attainment areas of California.

Lead Agency: ARB.

Desired Outcome: Increased biomass feedstock from hazardous fuel reduction projects in the South Coast AQMD.

Related Plan Objective: Construct new bioenergy facilities.

Completion Date: June 30, 2012.

1.6. Revisit Restrictions on the Injection of Biomethane Derived From Landfill Gas

- The Energy Commission, CalRecycle, and CPUC will work with California gas utilities and other stakeholders through a public process to address barriers to introducing landfill gas into the California natural gas pipeline.

Lead Agency: Energy Commission.

Desired Outcome: Increased use of landfill gas.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

1.7. Evaluate Bioenergy Policies in Other States and the European Union

- As part of the Energy Commission's membership in the Clean Energy States Alliance (CESA), CESA will conduct research and then prepare a white paper to identify and describe the most notable policies and programs employed by states in recent years to advance biomass power production, with a focus on electricity generation. Among the policies and programs that CESA will examine are tax incentives, grants, rules and regulations, financing and contracting, and procurement. To the extent practical, CESA will identify the strengths and innovations of the leading states' and the European Union's biopower strategies.

Lead Agency: Energy Commission.

Desired Outcome: Inform the Energy Commission of effective biopower policies and programs.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2011.

1.8 Develop a Program Environmental Impact Report for Conversion Technologies

- The Energy Commission will seek to fund and work with CalRecycle to analyze the potential environmental impacts of conversion technologies at a program level and develop a program Environmental Impact Report.

Lead Agency: Energy Commission and CalRecycle.

Desired Outcome: Provide background information on conversion technologies for future policy considerations, potential environmental impacts, and mitigation measures. This information will assist state and local agencies in preparing site-specific environmental documentation that may be required for conversion technology facility applications and/or permits submitted to CalRecycle and other state and local regulatory agencies.

Related Plan Objectives: Construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2013.

2. Actions Addressing Sustainable Feedstock Challenges

2.1. Sustainability Standards for Biomass Feedstock Sourcing

- The Energy Commission and Cal Fire will continue to work with the Interagency Forestry Working Group to assess and define sustainability standards for biomass feedstock sourcing.

Lead Agency: Energy Commission.

Desired Outcome: State standards defining sustainability that can be used to identify sustainable sources of biomass feedstock.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities by increasing forest biomass feedstocks.

Completion Date: December 31, 2012.

2.2. Increase Use of Forest Biomass Harvested for Wildfire Fuel Reduction

Collection of dispersed feedstock, such as forestry residues, is a labor intensive and expensive process. However, the collection and treatment of these residues have many benefits such as wildfire risk reduction, and improved forest health. Collaboration among state and federal forestry agencies and the biomass industry could increase sustainable feedstock collection and provide an opportunity to share the cost of collection and transportation.

- The Board of Forestry and Fire Protection (Board) is developing a Modified Timber Harvest Plan (THP) for Fuels Management, which prescribes standards for harvesting forest fuels that landowners can use to facilitate plan preparation and regulatory compliance. Cal Fire administers this THP process. The Board and Cal Fire are developing the Modified THP with input from other agencies, such as the Department of Fish and Game, to ensure that biomass fuel harvest activities protect the environment and are sustainable.

Lead Agency: Board of Forestry and Fire Protection.

Desired Outcome: A modified timber harvest plan that will increase access to affordable and readily available feedstock from wildfire hazard reduction and forest health activities.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities.

Completion Date: December 31, 2011.

2.3. Public Education and Outreach

- The Energy Commission will fund an outreach campaign using existing funding to educate utility ratepayers of the many benefits of using biomass residues from agriculture, forests, and urban-derived sources, to generate electricity. These benefits include greenhouse gas reductions, reduced air pollution, landfill diversion, renewable electricity, and green jobs in rural communities.

Lead Agency: Energy Commission.

Desired Outcome: Increased awareness of the public benefits of biopower.

Related Plan Objectives: Construct new bioenergy facilities.

Completion Date: September 30, 2011.

- The Board of Forestry and Fire Protection and Cal Fire will provide training workshops for Cal Fire staff to implement the 2010 Strategic Fire Plan to assist communities, local agencies and citizen groups such as Fire Safe Councils in reducing wildfire hazards and damages, including hazardous fuel removal. Trainings will improve identification of priority areas for fuels treatments and education about wood biomass treatments.

Lead Agency: Cal Fire.

Desired Outcome: Increased treatment of priority hazardous fuels which will improve community safety and forest health while generating woody biomass waste materials for energy production.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities.

Completion Date: December 31, 2011.

2.4. Web-Based Database of Biodegradable Waste for Codigestion at Wastewater Treatment Plants

- The Energy Commission's Public Interest Energy Research (PIER) Program will commit research dollars and work with the California Biomass Collaborative, the Department of Food and Agriculture, the U.S. Environmental Protection Agency, and industry associations to update and renew an existing Web-based database to provide location, volume, quality, and seasonality of biodegradable waste suitable for codigestion at wastewater treatment plants. The database will include waste from California's agriculture, food processing, and dairy industries.

Lead Agency: Energy Commission.

Desired Outcome: Updated and accessible public data source for regional operators to determine feedstock locations and seasonal variations.

Related Plan Objectives: Construct new bioenergy facilities; increase the development of integrated bioenergy facilities.

Completion Date: December 31, 2012.

- CalRecycle will work with the Energy Commission and the California Biomass Collaborative to integrate locations of post-consumer food waste into the Web-based database.

Lead Agency: CalRecycle.

Desired Outcome: Extend the scope of the database to include locations of post-consumer food waste in the data set.

Related Plan Objectives: Construct new bioenergy facilities; Increase the Development of Integrated Bioenergy facilities.

Completion Date: 2012.

2.5. Increase Energy Production From Urban Derived Biomass

- The Energy Commission will work with CalRecycle to determine the process by which source separated urban derived biomass (the organic fraction of solid waste) can be identified from other municipal solid waste in order for it to be considered biomass for the RPS. If necessary, the Energy Commission will clarify biomass eligibility in the *Renewables Portfolio Standard Eligibility Guidebook*.

Lead Agency: Energy Commission.

Desired Outcome: Clarify RPS eligibility guidelines that readily identifiable and separable biomass feedstock that may have entered the waste stream is an RPS eligible feedstock.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: June 30, 2011.

- The Energy Commission will work with CalRecycle and stakeholders to establish a process and definitions by which urban derived biomass (the organic fraction of solid waste) commingled with post-recycled municipal solid waste is considered biomass for the purposes of the RPS. If necessary, the Energy Commission will clarify biomass eligibility in the *Renewables Portfolio Standard Eligibility Guidebook*.

Lead Agency: Energy Commission.

Desired Outcome: Allow the organic fraction of MSW not derived from fossil fuel that is recovered and converted to electricity to be eligible for RPS credits.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies

Completion Date: December 31, 2012.

- The Energy Commission, in partnership with CalRecycle will provide technical review of proposed legislation that refines or removes statutory definitions relating to conversion technologies and the use of urban derived biomass from the municipal solid waste stream.

Lead Agency: Energy Commission and CalRecycle.

Desired Outcome: Provide technical review of proposed legislation that will allow technologies that convert post-recycled material into electricity to be eligible for the RPS and eliminate technology restrictions in statute.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

2.6. Support Deployment of Anaerobic Digestion Projects

To support the deployment of anaerobic digestion projects in California, the following actions will be taken:

- On February 14, 2011, CalRecycle released a Draft Program Environmental Impact Report for construction of anaerobic digesters throughout the state.¹⁴⁴ CalRecycle will finalize the Program Anaerobic Digestion Environmental Impact Report.
- CalRecycle will participate in the Advisory Committee for the Energy Commission's Alternative and Renewable Fuel and Vehicle Technology Program (AB 118).
- CalRecycle will provide technical reviews of relevant anaerobic digester project proposals submitted under the AB 118 program.

¹⁴⁴ Electronic copies of the Draft Program EIR can be downloaded from the CalRecycle website at: www.calrecycle.ca.gov/SWFacilities/Compostables/AnaerobicDig

- CalRecycle will work with the Air Resources Board to incorporate an anaerobic digestion pathway into the state's Low Carbon Fuel Standard.
- CalRecycle will work with the California Pollution Control Financing Authority to help anaerobic digestion project proposals obtain funding.
- CalRecycle will work with the California Biomass Collaborative to provide technical support for anaerobic digestion projects.
- CalRecycle will update guidance documents that outline how CalRecycle regulations are applied to anaerobic digester and the statutory requirements that CalRecycle and Local Enforcement agencies have regarding anaerobic digester when solid waste is used as a feedstock.

Lead Agency: CalRecycle.

Desired Outcome: Reduce by the amount of organic waste disposed in the state's landfills by promoting in-state development of biofuels and bioenergy projects.

Related Plan Objective: Construct new bioenergy facilities; Development of Integrated Bioenergy Facilities; Development of next generation technologies.

Completion Date: December 31, 2012.

2.7. Biomass Resource Assessment

- Energy Commission will work with the California Biomass Collaborative to determine if it is feasible to expand the Collaborative's biomass resource assessment to identify locations of biomass material by region and net out existing biomass demand.

Lead Agency: Energy Commission

Desired Outcome: Expand the scope of the Biomass Collaborative's biomass resource assessment.

Related Plan Objective: Construct new bioenergy facilities; Development of Integrated Bioenergy Facilities.

Completion Date: December 31, 2012.

3. Actions Addressing Economics and Financing Challenges

3.1. Ensure Continued Operation of Existing Biomass Facilities After Contract Expiration

- The Energy Commission will explore options to ensure that existing biomass facilities continue to operate. One option is through the continuation of the Existing Renewable Facilities Program.

Lead Agency: Energy Commission.

Desired Outcome: Continued operation and/or increased production at existing solid fuel biomass facilities.

Related Plan Objective: Increase and/or maintain bioenergy production at existing facilities.

Completion Date: December 31, 2011.

- Contract renegotiations with the utilities should also be considered as a long-term solution. The CPUC will work with the utilities and existing solid-fuel biomass facilities to ensure streamlined, quick, and fair processes through which they may renegotiate expiring contracts.

Lead Agency: CPUC.

Desired Outcome: Renegotiated and new contracts that provide for the continued operation and/or increased production at existing solid fuel biomass facilities.

Related Plan Objective: Increase and/or maintain bioenergy production at existing facilities.

Completion Date: December 31, 2011.

3.2. Alternative Fuel Investment Plan

To promote restarting or retooling existing biofuel plants, and to promote development of new in-state production capacity, the Energy Commission will develop and implement funding programs through the *Alternative and Renewable Fuel and Vehicle Technology Program*.

As part of the Alternative Fuels Investment Plan, the Energy Commission will do the following:

- The Energy Commission will allocate funding through fiscal year 2011 to support feasibility studies for low-carbon cellulosic ethanol feedstock, including feasibility studies of modifications to existing plants.
- The Energy Commission will fund research to improve conversion efficiencies of cellulosic biofuels derived from straw, corn stover, timber processing residues, and the organic fraction of MSW.

Lead Agency: Energy Commission.

Desired Outcome: Research results that will lead to reduce cost and greater efficiencies for advanced biofuel technologies.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

3.3. Implementation of Feed-In Tariffs for Renewable Projects

Small bioenergy developers, especially those whose main business is not energy production, could benefit from a simple and streamlined procurement tool that offers a price to provide incentives for new development.

- The Public Utilities Commission will continue to work on implementing and expanding feed-in tariffs for renewable energy projects through implementation of the SB 32 feed-in tariff and the Renewable Auction Mechanism (RAM) for projects up to 20 MW.

Lead Agency: CPUC.

Desired Outcome: Streamlined procurement mechanism for new and repowered bioenergy facilities.

Related Plan Objectives: Construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2011.

3.4. Funding for Integrated Biorefineries

- The Energy Commission's Public Interest Energy Research Renewable-Based Energy Secure Communities program will provide grants available to projects that capitalize on the synergies of colocating biopower or biofuel refineries with other biomass to energy projects,

manufacturing facilities, or waste diversion, composting, transfer/processing, or disposal facilities. This action will depend on reauthorization of the PIER program.

Lead Agency: Energy Commission.

Desired Outcome: Leverage public and private funding to reduce the cost of business and industry development and increase development of biomass markets, especially through co-locating bio-based energy facilities with manufacturing, composting, recycling or waste facilities.

Related Plan Objectives: Construct new bioenergy facilities; Development of Integrated Bioenergy Facilities; Development of next generation technologies.

Completion Date: December 31, 2012.

3.5. Funding for Advanced Biofuels and Renewable Energy Facilities

- CalRecycle's Recycling Market Development Zones program¹⁴⁵ may provide low interest loans to develop biofuels and renewable electricity using waste materials diverted from landfills.

Lead Agency: CalRecycle.

Desired Outcome: Increase the awareness of low-interest loan financing available through CalRecycle.

Related Plan Objectives: Construct new bioenergy facilities; development of integrated bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

4. Actions Addressing Biogas Quality Standards

4.1. Coordinate Efforts to Increase the Beneficial Use of Biogas

Project developers state that uniform and/or clearer gas quality standards for pipeline injection of biomethane would reduce the burden and cost faced by small developers to meet the standards.¹⁴⁶ A number of gas quality standards for pipeline injection are specified by the California utilities in their CPUC-approved tariff rules and some additional standards are specified in CPUC General Order 58-A. However, not all of the gas quality standards that may be appropriate for biomethane have been specified in the utility rules or in General Order 58-A. This has created different approaches by utilities applying the existing standards for biomethane injected into the natural gas pipeline.

The Energy Commission supports the establishment of state rules and requirements regarding transporting biogas and biomethane in California's natural gas pipelines and development of a set of uniform regulatory standards for pipeline quality.

To increase the beneficial use of biogas, the following actions will be taken:

- The Energy Commission, through the *Alternative and Renewable Fuel and Vehicle Technology Program*, will provide funding for research to reduce the cost of biomethane gas clean up to

¹⁴⁵ For more information on CalRecycle's Recycling Market Development Zones program, please go to www.calrecycle.ca.gov/rmdz/.

¹⁴⁶ Paul Relis, CR&R. *Staff Workshop 2010 Bioenergy Action Plan Transcript*, June 3, 2010, Page 94.

meet gas quality standards for use as a transportation fuel or injection into the natural gas pipeline.

Lead Agency: Energy Commission.

Desired Outcome: A set of policies, procedures and standards for injecting biogas into natural gas pipelines.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

- CPUC will work with the Energy Commission to examine whether additional gas quality standards should be adopted for biogas injected into utility natural gas pipelines. Preliminary joint CPUC/Energy Commission investigation into whether additional quality standards are needed and if a formal CPUC proceeding should be undertaken.
- If it is determined that a CPUC proceeding should be initiated and if it begins in 2011, the CPUC proceeding adopting new quality standards based upon preliminary investigation might be completed by the end of 2012.

Lead Agency: CPUC.

Desired Outcome: A set of policies, procedures and standards for injecting biogas into natural gas pipelines.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: June 30, 2011 (Preliminary investigation).

4.2. Evaluation of the Public Interest Natural Gas Research and Development Program

In CPUC decision D.04-08-010, the CPUC designated the Energy Commission as the administrator of the public interest natural gas research and development program, which is funded by utility ratepayers. Under D.04-08-010, CPUC staff has recently begun an evaluation of the program. CPUC staff expects that this effort will result in the CPUC's determination about whether the program should continue or be modified, and what priority and budget should be given to bioenergy research and demonstration as part of the natural gas R& D program.

Lead Agency: CPUC.

Desired Outcome: Improved design of research demonstration and development program for biogas.

Related Plan Objective: Increase production of biogas.

Completion date: December 31, 2011.

5. Actions Addressing Legislation and Statutory Challenges

5.1. Reauthorization of the California's Renewable Energy Program and the Existing Renewable Facilities Program.

- The Energy Commission will seek reauthorization of the Renewable Energy Program, including funding mechanisms to support the state's existing solid fuel biomass facilities. Funding mechanisms for the legislature to consider include current incentives, incentives for improving efficiency or repowering, and incentives for eligible feedstock purchases.

- The Energy Commission recommends that the legislature consider offering incentives for repowering existing biomass facilities and converting aging generation equipment to cleaner, low emission technologies.

Lead Agency: Energy Commission.

Desired Outcome: Reauthorization of the Renewable Energy Program and the Existing Renewable Facilities Program to support the continued operation and/or increased production at existing solid fuel biomass facilities.

Related Plan Objective: Increase and/or maintain bioenergy production at existing facilities.

Completion Date: September 15, 2011.

5.2. Reauthorization of the Energy Commission's Public Interest Energy Research Program (PIER).

- PIER has funded 41 bioenergy research and development projects and studies, and additional R&D initiatives are called for in this *Action Plan*. The Energy Commission will seek re-authorization of the PIER Program.

Lead Agency: Energy Commission.

Desired Outcome: Reauthorization of the PIER Program.

Related Plan Objective: Development of next generation technologies.

Completion Date: December 31, 2011.

5.3. Assess Legislative Changes to the Statutory Definition of MSW Conversion

- The Energy Commission, in partnership with CalRecycle, will continue to assess legislation to amend the definition of MSW conversion in statute, providing a technically accurate description of available conversion technologies that are eligible for the state's RPS.

Lead Agency: Energy Commission, CalRecycle, ARB.

Desired Outcome: Remove technology restrictions imposed by statute on the eligibility of conversion of post-recycled MSW to electricity for the RPS.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: December 31, 2012.

5.4. Monitor Changes to Federal Bioenergy Policies and Regulations

The Working Group will continue to monitor and comment on state and federal regulatory and legislative proposals that will impact the state's ability to meet its bioenergy goals, including but not limited to:

- Follow-up on the Governor's and state agencies' comment letter dated August 19, 2010, on U.S. EPA's proposed rule on Maximum Available Control Technology (MACT) for biomass facilities and on U.S. EPA's September 2010 request for comment on the carbon neutrality of biomass for EPA's GHG tailoring rule.
- Support federal legislation that allows states to implement feed-in tariffs for renewable energy projects, including bioenergy projects.

- Support federal legislation that allows use of woody biomass harvested sustainably from federal lands in California to be eligible as a renewable feedstock for the production of biofuels.
- Support extending federal tax credits for existing solid-fuel biomass facilities and new biomass and biogas facilities. The Working Group will also support development of federal tax credits for biogas injected into natural gas pipeline.

Lead Agency: Energy Commission.

Desired Outcome: Continuous monitoring of federal laws and regulations that may impact state bioenergy goals allowing the state to provide timely comments as issues arise.

Related Plan Objectives: Increase bioenergy production at existing facilities; construct new bioenergy facilities; development of next generation technologies.

Completion Date: Continuous.

CHAPTER 6:

Implementation of the 2011 Bioenergy Action Plan

Roles and Responsibilities

Bioenergy Interagency Working Group

Executive Order S-06-06 states, “*The Secretary for the California Resources Agency and the Chair of the Energy Resources Conservation and Development Commission (‘Energy Commission’) shall coordinate oversight of efforts made by state agencies to promote the use of biomass resources.*” The Order also requires that specified state agencies “*shall continue to participate on the Bioenergy Interagency Working Group chaired by the Energy Commission.*” Thus, the Energy Commission and the member agencies of the Working Group are responsible for achieving the targets established by Executive Order S-06-06.

The Working Group and its member agencies will carry out their individual and joint responsibilities. The Working Group will meet quarterly beginning in April 2011 to monitor and share information on the implementation of individual agency actions, to discuss continuing challenges to bioenergy development, and to plan future collaborative efforts aimed at addressing these challenges. These meetings will provide a forum for interested stakeholders and members of the public to track progress on implementing the 2011 Plan.

State Agencies

Each member of the Working Group will be responsible for implementing a portion of the 2011 Bioenergy Action Plan. These agencies have committed to taking actions within their purview to address one or more of the challenges facing bioenergy development. These actions are described in Chapter 5.

California Energy Commission

The Energy Commission will continue to lead, organize, and staff the Working Group. Energy Commission staff will provide quarterly reports to the Energy Commission’s Renewables Committee starting in June 2011.

Industry and Stakeholder Participation

Stakeholder participation is needed to implement the 2011 Plan. A number of actions require the Working Group to work with industry associations, the environmental community, and other interested parties. In addition, the Working Group will require stakeholders to provide feedback on the 2011 Plan, update staff on the challenges the industry is facing, and suggest additional actions that the Working Group should consider to achieve the state’s bioenergy goals. The Working Group will seek public involvement through workshops and public advisory groups as needed.

Tracking Agency Progress

At the quarterly meetings, the Working Group will discuss the progress of actions, obstacles that may delay implementation, and efforts to mitigate delays. These meetings will provide an opportunity to raise issues of concern and to discuss and solve problems collaboratively. The Energy Commission will document Working Group meetings for progress reports.

Measuring Achievement of the State's Biopower Goals

In June of each year, Energy Commission staff will summarize the progress of biopower development. The following indicators will be used to measure progress toward the biopower goals:

- Year-to-year change in the amount of in-state and out-of-state biopower generation.
- The estimated generation from new investor-owned utilities and publicly owned utility contracts involving biomass-to-energy.
- Year-to-year change in the amount of generation from existing biomass-to-energy facilities participating in production incentive payment programs.

The goals for biopower are defined in terms of the state's renewable energy goals for 2010 and 2020. The RPS targets within the state depend on whether the load serving entity is regulated by the CPUC (such as investor-owned utilities) or publicly owned. Load-serving entities regulated by the CPUC are mandated to procure 20 percent of their retail sales with renewable generation, whereas, publicly owned utilities are required to set their own renewable targets. The Renewable Electricity Standard (RES) adopted by the ARB requires certain regulated entities to procure 33 percent of their retail sales with renewables by 2020.¹⁴⁷ Measuring progress toward achieving these goals can be calculated as follows:

- The annual biopower (MWh) contributing to the RPS/RES divided by the total generation (MWh) contributing to the RPS/RES.

Data Sources

The flowing sources of information will be used to track and measure progress in meeting biopower goals:

Renewables Portfolio Standard (RPS): For 2010, investor-owned utilities, electric service providers, and community choice aggregators are required to procure 20 percent of retail sales of electricity from renewable resources.

RPS statute¹⁴⁸ requires that the Energy Commission and the CPUC work collaboratively to implement the RPS and assigned specific roles to each agency. To verify RPS compliance, the Energy Commission will use data from the Western Renewable Energy Generation Information System (WREGIS) to verify RPS energy claimed for 2008 and later years.¹⁴⁹ The Energy

147 On November 17, 2008, Governor Schwarzenegger signed Executive Order S-14-08, raising California's renewable energy goal to 33 percent by 2020. This Executive Order directed the ARB to adopt regulations as a way to achieve this goal.

On September 23, 2010, the California Air Resources Board unanimously adopted a 33% RES. The Board directed the Executive Officer to make certain changes to the RES regulation and then to post the modified regulation for 15-days public comment. After staff finalizes the regulation, it will be filed with the Office of Administrative Law (OAL) for final adoption. The regulation will be effective after OAL adoption.

148 Sher, Chapter 516, Statutes of 2002

149 Data on energy claimed through 2007 for the RPS is collected through an interim tracking process comparing procurement claims to generation data. For a summary of the data used for procurement claims and generation, see pp. 13-16, www.energy.ca.gov/2009publications/CEC-300-2009-006/CEC-300-2009-006-CMD.PDF.

Commission's RPS tracking data could be used to provide information regarding the amount of biopower procured as a portion of total RPS energy. For example, the Energy Commission publishes information on verified procurement and energy deliveries claimed for the RPS.¹⁵⁰

RPS and RES recordkeeping and reporting: The recordkeeping and reporting for the RPS and RES can provide further information regarding the amount of biopower procured as a portion of total RPS and RES energy.

Power Source Disclosure Program: Senate Bill 1305¹⁵¹ requires retail suppliers of electricity to disclose to consumers "accurate, reliable, and simple-to-understand information on the sources of energy that are (being) used. . ."¹⁵²

The law requires that these suppliers disclose the type of resource used to generate the electricity being provided. The suppliers are required to use a format developed by the California Energy Commission called the *Power Content Label*.

SB 1305 also required electricity generators that report meter data to a system operator to report generation, fuel type, and fuel consumption data to system operators quarterly.

Generators that do not report information to system operators but whose electricity is being claimed as a specific purchase report this data directly to the Energy Commission. System operators must then make the generation and fuel source information available to the Energy Commission for verifying information disclosed to consumers and calculating net system power.

Quarterly Fuels and Energy Reporting Program: All generators that are 1 megawatt or larger in California report actual generation and fuel use to the Energy Commission under the Quarterly Fuels and Energy Reporting requirements.

Measuring Achievement of State Biofuel Goals

ARB requires each regulated party to reduce the average carbon intensity measured as grams carbon dioxide equivalent per megajoule of the fuel it provides for sale in California. For the LCFS, regulated parties are the producers or importers of each transportation fuel, as specified.¹⁵³ Regulated parties are required to file quarterly progress reports and annual compliance reports.¹⁵⁴

The reporting tool for biofuel producers¹⁵⁵ being developed for the LCFS includes information on the type of fuel, volume of fuel in terms of gallons of gasoline equivalent (gge), and physical

150 California Energy Commission, July 2010, Draft Commission *RPS 2006 Verification Report*, www.energy.ca.gov/2009publications/CEC-300-2009-006/CEC-300-2009-006-CMD.PDF, p. 13-20.

151 Senate Bill 1305, Sher, Chapter 796, Statutes of 1997.

152 Public Utilities Code Section 398.1(b)

153 www.arb.ca.gov/regact/2009/lcfs09/lcfscmbfinal.pdf.

154 www.arb.ca.gov/regact/2009/lcfs09/lcfscmbfinal.pdf.

155 See the LCFS Reporting Tool Workgroup materials, available at www.arb.ca.gov/fuels/lcfs/workgroups/workgroups.htm.

pathway¹⁵⁶ to California. This information can be used to determine the number of gallons of gasoline equivalent produced from biofuels in California compared to total biofuels consumed in California.

Regarding verification, the LCFS states: “All data and calculations submitted by a regulated party for demonstrating compliance or claiming credit are subject to verification by the Executive Officer or a third party approved by the Executive Officer.”¹⁵⁷ Under PIIRA, both fuel producers and major transporters are required to report fuel production and movement to the Energy Commission monthly.

Data Sources

The Energy Commission’s *AB 118 Investment Plan* has expressed these goals in terms of gallons of gasoline equivalent: “Increase biofuel use to 1 billion gge [note omitted] by 2010, 1.6 billion gge by 2020, and 2 billion gge by 2050.” The following sources of information will be used to track and measure progress in meeting biofuel goals:

Low Carbon Fuel Standard: The California ARB’s Low-Carbon Fuel Standard requires a reduction in the full fuel-cycle, carbon intensity of the transportation fuel pool used in California by 10 percent by 2020.¹⁵⁸ As part of the LCFS, ARB is developing a reporting process for biofuels.¹⁵⁹ Staff recommends using the ARB’s LCFS biofuels data collection, verification, and compliance processes to track progress toward achieving the Governor’s biofuel goals. An additional method that could be used to track biofuel production in California is the Petroleum Industry Information Reporting Act (PIIRA). PIIRA was enacted in 1980 to gather information on the transportation fuels industry, enabling the state government to better respond to shortages, address supply disruptions, and to provide informed analysis of legislation affecting the industry. With the growing need to decrease the state’s dependence on foreign oil and reduce the environmental impacts of conventional fuels, the California transportation fuels industry has diversified the fuel types produced and transported throughout the state. To monitor the production and transportation of biofuels, the PIIRA reporting requirements have recently expanded beyond the collection of information on conventional petroleum-based fuels, to also include the production and movement of fuel ethanol, biodiesel, and their associated feedstocks.

Reporting Progress

Executive Order S-06-06 directs the Energy Commission to report on progress toward achieving the bioenergy goals as part of the biennial *Integrated Energy Policy Report*. Since the first

156 The LCFS defines “physical pathway” as follows: “the applicable combination of actual fuel delivery methods, such as truck routes, rail lines, gas/liquid pipelines, electricity transmission lines, and any other fuel distribution methods, through which the regulated party reasonably expects the fuel to be transported under contract from the entity that generated or produced the fuel, to any intermediate entities, and ending at the fuel blender, producer, importer, or provider in California.”

157 www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf.

158 California ARB’s Low Carbon Fuel Standard regulation is available at www.arb.ca.gov/regact/2009/lcfs09/lcfscombofinal.pdf.

159 See the LCFS Reporting Tool Workgroup materials, available at www.arb.ca.gov/fuels/lcfs/workgroups/workgroups.htm.

Bioenergy Action Plan was issued in 2006, two *Progress to Plans* (progress reports) have been published:

- *Bioenergy Action Plan: Progress to Plan*, published in 2007.¹⁶⁰
- *2009 Progress to Plan: Bioenergy Action Plan for California*.¹⁶¹

In consultation with the Working Group, the Energy Commission plans to publish the next *Progress to Plan* in late 2011.

¹⁶⁰ www.energy.ca.gov/2007publications/CEC-100-2007-006/CEC-100-2007-006.PDF.

¹⁶¹ www.energy.ca.gov/2010publications/CEC-500-2010-007/CEC-500-2010-007.PDF.

Appendix A: California's Air Regulatory Structure

The California Air Resources Board (ARB) has established health-based ambient air quality standards to identify outdoor pollutant levels considered safe for the public. State law requires ARB to designate areas as attainment, nonattainment, nonattainment-transitional, or unclassified for each state standard, indicating the healthfulness of the air quality in each area. The federal Clean Air Act requires states to directly regulate sources of air pollution through a state implementation plan to provide for implementation, maintenance, and enforcement of national ambient air quality standards.

In California, responsibility for attaining and maintaining ambient air quality standards is divided among ARB and the 35 independent local air pollution control and air quality management districts (districts). California is also geographically divided into 15 air basins for managing the air resources of the State. The responsibility for controlling pollution from stationary sources, such as power plants, lies with the districts. This responsibility includes developing region-specific rules, permitting, enforcement, collecting data associated with emissions inventory, and preparing local air quality plans.

District rules define the procedure and criteria that districts must use in permitting stationary sources. Although district specific rules vary in scope and level of stringency depending on its area designation, the general procedure for permitting new and expanding sources is the same throughout the State. Pollutant-emitting sources must first obtain an authority to construct (or permit to construct) before beginning construction, and a permit to operate after the completed facility demonstrates compliance with district rules and the facility's permit conditions.

District requirements for stationary sources generally fit into two categories. The first category, the New Source Review (NSR) program, applies to the construction and operation of new and modified (or expanding) stationary sources. The second category, commonly referred to as prohibitory rules, is requirements that new and existing sources must meet.

The California NSR program allows industrial growth to continue in polluted areas while not increasing emissions of non-attainment pollutants or their precursors. This is accomplished through two major requirements in each district NSR rule: 1) best available control technology (BACT)¹⁶² and 2) offsets.

Depending on the quantity of air pollutants that will be emitted from the source and the area designation for that pollutant, the new or modified source may be required to install BACT. BACT is triggered on a pollutant-by-pollutant basis and on an emission unit basis (generally an individual piece of equipment or an integrated process consisting of several pieces of equipment).

BACT requires use of the cleanest, state-of-the-art technology to achieve the greatest feasible emission reductions. To identify BACT for a specific piece of equipment or process, district staff conducts a comprehensive case-by-case evaluation of the cost and effectiveness of technologies

¹⁶² Districts in California, use the term "best available control technology" (BACT) when referring to the emission control requirements of their NSR permitting programs. With few exceptions, the district definitions of BACT are based on the more stringent federal "lowest achievable emission rate" (LAER) requirements.

or strategies. This includes obtaining testing results or similar proof that the emission levels have been achieved in practice. District staff also conducts a broad search (internationally, in some instances) for technologies or strategies that have demonstrated (through testing on similar categories of stationary sources) a reduction in emissions to the lowest levels. The cost of the identified technologies is compared to the district BACT cost-effectiveness threshold. If the cost is lower than the threshold, then the technology or strategy can be designated as BACT for that category of stationary source. District staff does not consider cost for technologies or strategies that are already deemed achieved in practice.

In addition to BACT requirements, owners of new or modified sources may be required to mitigate, or offset, the increased emissions that result after installation of BACT. Offsetting is the use of emission reductions from existing sources to offset emission increases from new or expanding sources. This may be done by purchasing emission reduction credits (ERC) from another company and/or cleaning up the existing facility (or a source owned by another company) beyond what is required by law. The amount of offsets required depends on the distance between the source of offsets and the new or modified source.

Offsets are generally required at a greater than 1-to-1 ratio so that when the new or modified facility begins operation, more emissions are reduced than are increased. If a source obtains emission offsets outside the local area (that is, interbasin), or if one type of pollutant is offset against another type (that is, interpollutant), the source must use air quality modeling to show that these offsets will result in a net benefit. Some districts have pre-established ratios for interpollutant offsets in their rules. While BACT is triggered on an emission unit basis, offsets are triggered on a project basis.

Each district has prohibitory rules aimed at limiting emissions from new and existing stationary sources. In most cases where BACT is required for a particular pollutant, the required control technology and corresponding emission level will be more stringent than what is required by the prohibitory rule. The developer of a new or expanding source will have to demonstrate compliance with both NSR and prohibitory rule requirements in any permit application submitted to the district.

Appendix B: The Air Resources Board's Cap-and-Trade Program

Background

Assembly Bill 32 directs the Air Resources Board (ARB) to develop measures and regulations to reduce California's greenhouse gas (GHG) emissions to 1990 levels by 2020. As part of a suite of complementary policies designed to work together to reduce GHG emissions, the Board considered a proposed cap-and-trade program at the hearing on December 16. The approved resolution is available on the ARB rulemaking webpage.¹⁶³ The cap-and-trade program covers about 85 percent of the State's GHG emissions and allows trading to ensure cost-effective emissions reductions. This document describes key components of the cap-and-trade program.

Cap-and-Trade

Cap and trade is a policy tool designed to reduce GHG emissions through a declining limit on emissions allowable under the program. The limit is established by creating and distributing allowances, or tradable permits, equal to the amount of allowable GHG emissions. Starting in 2012, the California cap-and-trade program will cover GHG emissions from large industrial sources and electricity generation at or above 25,000 metric tons of carbon dioxide equivalent (CO₂e) and electricity imports (narrow scope). In 2015, the scope expands for added coverage of emissions from combustion of gasoline, diesel, natural gas and propane that is not from the large stationary sources (broad scope). An entity is covered if its emissions meet or exceed the threshold. The cap-and-trade program will ultimately cover approximately 360 businesses representing 600 facilities.

Mandatory GHG Reporting

Since 2008, the California Air Resources Board Mandatory Reporting Regulation (MRR) has required GHG emissions data reports annually from the following industrial sectors: cement plants, oil refineries, hydrogen plants, electricity generating facilities, cogeneration facilities, other large stationary combustion sources, and electricity retail providers and marketers. Only sources that meet certain emissions thresholds are subject to reporting.

On December 16, the Board also considered a revision to the MRR. The MRR revisions were needed in order to collect data that are consistent with the requirements of the cap-and-trade program, to harmonize California reporting requirements with U.S. EPA reporting requirements, and provide consistency with Western Climate Initiative¹⁶⁴ (WCI) reporting requirements.

The Emissions Cap and Compliance Obligation

The 2012 cap is set at the best estimate of actual covered emissions for that year. Each year the amount of allowed emissions, and therefore the number of allowances created and distributed declines. In 2015, the cap increases by adding our best estimate of actual emissions from combustion of fuels in California to the narrow scope cap. The cap declines approximately 2 percent per year in the first compliance period (2012-14), and declines approximately 3 percent per year starting in 2015. The cumulative reduction needed from 2012 through 2020 is 273

¹⁶³ www.arb.ca.gov/regact/2010/capandtrade10/capandtrade10.htm

¹⁶⁴ The WCI is a collaboration of independent jurisdictions who commit to work together to identify, evaluate, and implement policies to tackle climate change at a regional level.

million metric tons of CO₂ equivalent (MMTCO₂e). The 2020 cap is about 15% below 2012 covered emissions. A covered entity has a compliance obligation under the program equal to the total amount of their covered emissions. Covered entities comply by surrendering compliance instruments (allowances and offsets, explained below), equal to their emissions for a given period. Allowances and Allowance Distribution Allowances are tradable permits equal to the cap (1 allowance=1 MTCO₂e), which are created and distributed by ARB. The regulation proposes a phased approach to the development of an auction system, beginning with a high percentage of free allocation in the beginning of the program. Industrial sector allocation is based on the amount of product output multiplied by an emissions efficiency benchmark for similar products. Allocation to each covered entity changes annually in response to changes in production, with more allowances provided for greater production at the facility. For the electricity sector, ARB allocates a defined share of allowances to distribution utilities on behalf of their customers. Approximately 4 percent of all allowances go into a strategic reserve for cost containment. Allowances in the reserve are available for sale once quarterly at set prices in three tiers (starting at \$40, \$45, and \$50 in 2012). ARB will auction the remainder of allowances.

Offsets

An offset credit represents 1 metric ton of CO₂ equivalent emissions reduction from a source not directly covered by the cap-and-trade program. The program will allow the use of offsets for up to 8 percent of a facility's emissions. The Board initially considered four offset protocols as part of the program: forestry; urban forestry; livestock (manure/methane) management; and, destruction of existing stock of ozone-depleting substances. The validity of offsets will be supported by independent third-party verification.

Compliance and Enforcement

Each year starting in 2013, covered entities are required to surrender allowances and offsets for 30 percent of the previous year's emissions. Once every three years starting in 2015, covered entities are required to surrender allowances and offsets for the remainder of their emissions for that three-year compliance period (i.e., 2012-14; 2015-17; 2018-2020). If the compliance deadline is passed, the compliance obligation becomes allowances for every ton of remaining emissions.

Biomass-Derived Fuels

The proposed cap-and-trade regulation excludes combustion emissions from specified biomass-derived fuels from counting toward a compliance obligation if the biomass-derived fuel is reported and verified pursuant to MRR. Emissions from fossil fuels that supplement biomass-derived fuel combustion and emissions from unverified biomass-derived fuels count toward an entity's compliance obligation provided those emissions meet or exceed the cap-and-trade threshold. The decision to exclude all biomass CO₂ emissions from the cap-and-trade program does not imply that all biomass CO₂ emissions are inherently carbon neutral; rather, it reflects a policy decision that the impacts of biomass CO₂ emissions are best addressed outside the cap-and-trade program. MRR requires facilities to report fuel consumption by type, so ARB will track emissions from combustion of biomass-derived fuels.

Next Steps¹⁶⁵

Staff will develop changes to the proposed cap-and-trade rule based on Board direction and stakeholder comments. ARB will publically notice the proposed changes in summer 2011 and stakeholders will have 15 days to review and comment.

¹⁶⁵ www.arb.ca.gov/cc/capandtrade/capandtrade/programactivities.pdf

Appendix C: Acronyms

Abbreviation	Meaning
AD	anaerobic digester
ARB	Air Resources Board
BACT	Best Available Control Technology
BDT	bone dry tons
Btu	British thermal unit
CalEPA	California Environmental Protection Agency
CCAs	Community Choice Aggregators
CCGT	combined cycle gas turbine
CHP	combined heat and power
CPUC	California Public Utilities Commission
DOE	U.S. Department of Energy
EIR	environmental impact report
EPA	Environmental Protection Agency
ERCs	emission reduction credits
ERFP	Existing Renewable Facilities Program
ESPs	Electricity Service Providers
FOG	fats, oil, and grease
gge	gallons of gasoline equivalent
GHG	greenhouse gas
GTI	Gas Technology Institute
GWh	gigawatt-hour
IEPR	<i>Integrated Energy Policy Report</i>
IOU	investor-owned utility
kW	kilowatt
LAER	Lowest Achievable Emission Rate
LCFS	Low-Carbon Fuel Standard
LFG	landfill gas
MACT	Maximum Achievable Control Technology
MPR	market price referent
MSW	municipal solid waste
MW	megawatt
NAAQS	national ambient air quality standards
NOx	nitrogen oxide
NSPR	Net System Power Report
NSR	New Source Review
PHMSA	U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration
PIER	Public Interest Energy Research Program
PIIRA	Petroleum Industry Information Reporting Act
PM-10	particulate matter 10-microns or less in size

POU	publicly owned utility
PSD	Prevention of Significant Deterioration
RES	Renewable Electricity Standard
RPS	Renewables Portfolio Standard
SCAQMD	South Coast Air Quality Management District
scf	standard cubic feet
scfm	standard cubic feet per minute
THP	Timber Harvest Plan
TSP	Total System Power
WREGIS	Western Renewable Energy Generation Information System